Boot Version 10.2 for NIC, iSCSI, FCoE, and RoCE Protocols

User Manual

EMULEX CONFIDENTIAL. Copyright © 2003–2014 Emulex. All rights reserved worldwide. No part of this document may be reproduced by any means or translated to any electronic medium without the prior written consent of Emulex.

Information furnished by Emulex is believed to be accurate and reliable. However, no responsibility is assumed by Emulex for its use; or for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent, copyright or related rights of Emulex.

Emulex, the Emulex logo, AutoPilot Installer, AutoPilot Manager, BlockGuard, Connectivity Continuum, Convergenomics, Emulex Connect, Emulex Secure, EZPilot, FibreSpy, HBAnyware, InSpeed, LightPulse, MultiPulse, OneCommand, OneConnect, One Network. One Company., SBOD, SLI, and VEngine are trademarks of Emulex. All other brand or product names referenced herein are trademarks or registered trademarks of their respective companies or organizations.

Emulex provides this manual "as is" without any warranty of any kind, either expressed or implied, including but not limited to the implied warranties of merchantability or fitness for a particular purpose. Emulex may make improvements and changes to the product described in this manual at any time and without any notice. Emulex assumes no responsibility for its use, nor for any infringements of patents or other rights of third parties that may result. Periodic changes are made to information contained herein; although these changes will be incorporated into new editions of this manual, Emulex disclaims any undertaking to give notice of such changes.

Emulex, 3333 Susan Street

Costa Mesa, CA 92626

Note: References to OCe11100 series products also apply to OCe11100R series products.

Table of Contents

List of Figures 13

List of Tables 19

1. Introduction 20

Overview 20

Abbreviations 21

2. Configuring PXE Boot for NIC on LPe16202, OCe10100, and OCe11100-series Adapters 25

Pre-OS 25

PXE Boot Process 25

Remotely Installing with PXE for Windows Server 2008, 2008 R2, 2012, and 2012 R2 27

Remotely Installing with PXE for Linux and Citrix Servers 27

Using the PXESelect Utility 28

Navigating the PXESelect Utility 28

Running the PXESelect Utility 28

Setting Up a PXE Bootable Network 29

Personality Option 30

Configuring the Custom Personality Selection 31

Advanced Mode Support 32

Configuring Ports When Multichannel is Disabled or Not Supported 34

Configuring PXE Boot Support 34

Configuring SR-IOV 35

Configuring the PXE VLAN ID and Priority 35

Physically Identifying the Port 36

Erasing Ports and Controller Configuration 36

Configuring Universal Multichannel 37

Configuring Minimum and Maximum Bandwidth 38

Configuring LPVID 38

Configuring Multichannel for IBM Adapters 39

Multichannel Modes 40

Multichannel Configuration 40

PXE Boot Parameters Default Values 42

3. Configuring PXE Boot for NIC on OCe14000-series Adapters 43

Pre-OS 43

PXE Boot Process 43

Remotely Installing with PXE for Windows Server 2008, 2008 R2, 2012, and 2012 R2 45
Remotely Installing with PXE for Linux and Citrix Servers 45
Using the PXESelect Utility 46
Navigating the PXESelect Utility 46
Running the PXESelect Utility 46
Setting Up a PXE Bootable Network 47
Configuring Ports When Multichannel is Disabled or Not Supported 49
Configuring Personality 49
Configuring SR-IOV 50
Configuring NIC Mode 51
Loading Default Settings 51
Selecting a Port 51
Viewing NIC Configuration Information 52
Configuring Boot Options 53
Configuring Port Options 54
Erasing Ports and Controller Configuration 55
Configuring Multichannel 56
Enabling Multichannel 56
Configuring Personality 57
Loading Default Settings 58
Selecting a Port 59
Configuring Multichannel Options 60
Configuring Minimum and Maximum Bandwidth 61
Configuring LPVID 61
Configuring Multichannel for IBM Adapters 62
Multichannel Modes 63
Multichannel Configuration 63
PXE Boot Parameters Default Values 65
4. Configuring Boot from SAN for the FCoE Protocol 67
Windows Server 2008, Windows Server 2012, and Windows Server 2012 R2 67
Configuring Boot from SAN on Windows (x64) 67
Configuring Boot from SAN on Windows (UEFI) 68
Installing a New Windows UEFI-aware Operating System on a UEFI-based x64 Server 68
Directing a UEFI-based Server to a Windows Server 2008, 2008 R2, 2012, or 2012 R2 Operating System Image (Installed as UEFI-aware) Already Installed on the SAN 69
GUID Partition Table 69

Installing Windows Server 2008, 2008 R2, 2012, or 2012 R2 on a Boot Disk (x64) 70
Linux, Citrix, and VMware 71
Configuring Boot from SAN on Linux, Citrix, or VMware (x86 and x64) 71
Configuring Boot from SAN on Linux (UEFI) 71
Solaris 72
Configuring Boot from SAN on Solaris SFS (x86 and x64) 72
Determining LUNs to Select for Boot from SAN 72
Configuring Boot from SAN on Solaris SFS (SPARC) 73
Installing Solaris from a Network Image 73
Installing Solaris by Migrating an Image from a Local SCSI Disk 75
Booting Solaris 10 from the Network on SPARC Machines 78
5. Configuring x86/x64 Platforms for the iSCSI Protocol 80
iSCSI Overview 80
Constructing a Basic iSCSI SAN 80
Managing an iSCSI Session 81
Logging into an iSCSI Session 81
Security 81
CHAP Authentication 81
Configuring for the iSCSI Protocol 81
Setting Up Boot from SAN for iSCSI 81
Windows Server 82
Linux and Citrix Servers 82
ESXi Server 83
Booting from SAN for iSCSI MPIO 83
Windows Server 83
Linux and Citrix Servers 84
ESXi 5.0, 5.1, or 5.5 Server 86
6. Using the FCoE Boot BIOS Utility for x86 and x64 Architectures 87
Navigating the FCoE BIOS Utility 87
Starting the FCoE BIOS Utility 87
Enabling an Adapter to Boot from SAN 88
Scanning for Target Devices 89
Configuring Boot Devices 90
Configuring CEE Parameters 93
Configuring Advanced Adapter Parameters 93
Changing the Default AL_PA 94

Changing the PLOGI Retry Timer 96
Enabling or Disabling the Spinup Delay 97
Setting Auto Scan 98
Enabling or Disabling EDD 3.0 99
Enabling or Disabling the Start Unit Command 99
Enabling or Disabling the Environment Variable 100
Enabling or Disabling Auto Boot Sector 101
Using Multi-Path Boot from SAN 101
Resetting to Default Values 102
7. Updating and Enabling Boot Code 104
8. Configuring iSCSI Boot Support with the iSCSISelect Utility 105
Navigating the iSCSISelect Utility 105
Setting Up a Basic iSCSI Boot Configuration 105
Booting the System 107
9. Configuring and Managing the iSCSI Initiator with the iSCSISelect Utility 108
Configuring the iSCSI Initiator Name 108
Selecting a Controller 109
Viewing the Controller Properties 110
Enabling Boot Support 110
Enabling IPv4 Boot Target Discovery using DHCP 111
Enabling the MPIO Port 111
Configuring Network Properties 112
Selecting the IP Version 113
Configuring VLAN ID and VLAN Priority 113
Configuring the IP Address 114
Configuring the IPv4 Address 114
Configuring the IPv6 Address 115
Configuring a Static IPv4 Address 116
Configuring a Static IPv6 Address 117
Pinging the iSCSI Initiator 117
Identifying a Port 118
Erasing the Current Configuration 118
10. Configuring and Managing iSCSI Targets with the iSCSISelect Utility 119
Adding iSCSI Targets 119
Using SendTargets Discovery to Add an iSCSI Target 120

Manually Adding an iSCSI Target 122
Managing an iSCSI Target 123
Viewing Target Information 123
Editing a Target Configuration..... 124
Setting an ISID Value 125
Enabling CHAP Authentication 125
Pinging a Target..... 128
Viewing Advanced Target Properties 128
Configuring LUN Settings 129
Removing and Logging Out and In of a Configured Target 129
Booting the System 130
Discovering Targets through DHCP for iSCSI 131
Enabling DHCP Discovery Through the iSCSISelect Utility 133
11. Configuring UEFI for Ethernet 134
Overview.....134
Navigating the Emulex NIC Configuration Utility 134
Starting the Emulex NIC Configuration Utility.....135
Advanced Mode Support 137
Configuring Boot Mode 138
Configuring iBFT 139
Changing the iSCSI Name 140
Selecting Multipath I/O 140
Configuring CHAP Authentication Mode 140
Configuring Network Settings 141
Configuring the Primary and Secondary Targets 143
Configuring Personality 145
Selecting the NIC+RoCE Personality..... 147
Selecting the Custom Personality 148
Configuring the Controller When Multichannel is Disabled or Not Supported 149
Viewing the Configuration..... 150
Configuring SR-IOV..... 150
Configuring NIC Mode 151
Saving the Current Configuration 152
Configuring Universal Multichannel 153
Viewing the Configuration..... 155
Configuring Minimum and Maximum Bandwidth..... 156
Configuring the LPVID 157
Saving the Configuration..... 158
Configuring Multichannel for IBM Adapters 158

Multichannel Modes 159
Multichannel Configuration 159
Port Management 163
Feature on Demand 164
Downloading Firmware and Boot Code 165
Identifying a Port 168
Erasing Ports and Controller Configuration 169
UEFI NIC Diagnostics 170
EFI_DRIVER_DIAGNOSTICS_PROTOCOL 170
12. Configuring UEFI for iSCSI 172
Overview 172
Navigating the Emulex iSCSI Configuration Utility 172
Starting the Emulex iSCSI Configuration Utility 173
Configuring MPIO 174
Configuring Boot Support 176
Viewing the Controller Properties 177
Configuring the Network 178
Configuring the IP Version 179
Configuring an IPV4 Address 180
Automatically Assigning an IP Address through a DHCP Server 180
Manually Assigning an IP Address 181
Pinging the iSCSI Initiator 181
Configuring an IPV6 Address 182
Automatically Configure an IP Address 182
Configuring the IPv6 Address 183
Pinging the iSCSI Initiator 183
Configuring VLAN ID/Priority 184
Updating Firmware 185
Adding and Configuring Targets 185
Discovering and Adding Boot Targets through DHCP 185
Using SendTargets Discovery to Add an iSCSI Target 186
Manually Adding, Discovering, and Managing Boot Targets 188
Setting a Boot Target 190
Selecting an Authentication Method 191
Pinging a Target 192
Viewing Advanced Properties 193
Logging In or Logging Out of a Target 194
Deleting a Target 194

Configuring LUNs 195
iSNS Configuration 196
Enabling iSNS Discovery 197
Enabling iSNS Server Discovery via DHCP 197
Configuring the iSNS Server IP Address and TCP Port Number Manually 198
Discovering Targets Using the iSNS Server 200
Erasing the Configuration 201

13. Configuring UEFI for FCoE 202
Overview 202
Navigating the Emulex FCoE Configuration Utility 202
Starting the Emulex FCoE Configuration Utility 203
Updating Firmware and Boot Code 204
Enabling an Adapter to Boot from SAN 204
Configuring CEE FCF Parameters 205
Scanning for Fibre Devices 207
Adding Boot Devices 207
Deleting Boot Devices 209
Changing Boot Device Order 210
Configuring Adapter Parameters 213
Changing the PLOGI Retry Timer 213
Changing the Maximum LUNs per Target 214
Changing Boot Target Scan Method 215
Changing Device Discovery Delay 217
Resetting Emulex Adapters to Default Values 218
Displaying Adapter Information 220

14. Troubleshooting 221
Troubleshooting for the NIC Protocol 221
Issues During the PXE Boot Process 221
PXE Error Codes 221
Troubleshooting for the iSCSI Protocol 224
Troubleshooting for the FCoE Protocol 227

Appendix A. Configuring iSCSI through a DHCP Server using Vendor-Specific Option 43 228
Overview 228
Format of Vendor-Specific Option 43 228
Description of Parameters 228

Example 229

Appendix B. Example for Installing and Configuring Linux or Citrix for PXE Boot and UEFI Boot 230

Linux and Citrix PXE Server Remote Installation Procedure 230

PXE Server 231

NFS Server Configuration Script 231

TFTP Server Setup 232

DHCP Server Configuration 233

PXE Boot Server Configuration 234

Copying Files to the TFTP Server with the Graphical Version of the Network Booting Tool 234

Configuring the Host 236

Enabling the PXE Client with a PXE-enabled Adapter 237

Appendix C. Examples for Configuring and Booting UEFI NIC 238

UEFI NIC Server Configuration Script for SLES11 SPx 238

NFS Server Configuration Script 239

DHCP Server Configuration 240

TFTP Server Setup 241

UEFI NIC Server Configuration Script for RHEL 6.x 241

Setup Information 241

NFS Configuration 241

TFTP Configuration 242

PXE Configuration 243

Configuring DHCP 244

Configuring the IBM HS22 Blade with e-Raptor MEZZ 245

UEFI NIC IPv6 PXE Setup Procedure for SLES11 SP2 253

Setup Information 253

PXE Server Setup 253

Configure Network Adapter 253

Disable Firewall 253

Install Services 253

Configure DHCPD6 254

Configure TFTP 254

Configure ELILO Boot Loader 255

Create /tftpboot/elilo.conf with the Following Contents 255

Copy Installation Files for FTP Transfer 255

Configure FTP to Enable Support for IPv6 255

Restart the Necessary Services 260

PXE Client Setup 260

Appendix D. Example for Installing and Booting UEFI FCoE 268

Appendix E. Loading and Unloading UEFIBoot from the UEFI Shell 270

Loading UEFIBoot from the UEFI Shell 270

Unloading UEFIBoot from the UEFI Shell 270

Appendix F. Dell UEFI 271

Accessing the Main Configuration Page 271

Main Configuration Page 272

Firmware Image Properties Page 274

FCoE Configuration Page 275

FCoE General Parameters Page 276

NIC Configuration Page 278

iSCSI Configuration Page 280

iSCSI General Parameters Page 281

iSCSI Initiator Parameters Page 283

iSCSI First Target Parameters Page 284

iSCSI Second Target Parameters Page 286

iSCSI Secondary Device Parameters Page 287

Device Level Configuration Page 288

NIC Partitioning Configuration Page 289

Global Bandwidth Allocation Page 290

Partition Configuration Page 291

Appendix G. Configuring PXE Boot for NIC on Dell OCe10100-based Systems 293

Running the PXESelect Utility 293

Navigating the PXESelect Utility 293

Setting Up a PXE Bootable Network 294

Configuring the Hide Setup Prompt 295

Configuring the Banner Message Timeout 295

Setting the Configured Port Speed 295

Configuring PXE Boot Support 296

Configuring the Boot Retry Count 296

Configuring Wake on LAN 296

Configuring Flow Control 296

Configuring SR-IOV 297

Configuring the PXE VLAN ID and Priority 297

Physically Identifying the Port 297

Erasing Ports and Controller Configuration 298

PXE Boot Parameters Default Values 299

Appendix H. Configuring PXE Boot for NIC on Dell OCe14000-based Systems 300

Running the PXESelect Utility 300

Navigating the PXESelect Utility 300

Setting Up a PXE Bootable Network 301

Configuring NPar 303

Selecting the Protocol 304

Configuring Minimum and Maximum Bandwidth 305

Enabling NParEP Support 305

Configuring Boot Options 306

Configuring PXE Boot Support 307

Configuring the Hide Setup Prompt 307

Configuring the Banner Message Timeout 307

Configuring the Boot Retry Count 307

Configuring Port Options 308

Setting the Configured Port Speed 308

Configuring Wake on LAN 308

Configuring Flow Control 309

Configuring the PXE VLAN ID and Priority 309

Physically Identifying the Port 309

Erasing Ports and Controller Configuration 310

PXE Boot Parameters Default Values 310

Appendix I. Booting the Solaris Operating System from the Network on SPARC Systems 312

List of Figures

Figure 2-1 PXE Boot Process 26
Figure 2-2 Controller Selection Menu 29
Figure 2-3 Controller Configuration Menu 29
Figure 2-4 Port Selection Menu 30
Figure 2-5 Controller Configuration Menu – Personality Selection 31
Figure 2-6 Custom Personality Selection on Multichannel Configuration Screen 32
Figure 2-7 Controller Configuration Menu – Advanced Mode Support Selection 33
Figure 2-8 Port Configuration Screen 34
Figure 2-9 Configure PXE VLAN ID/Priority Menu 35
Figure 2-10 Port Identification Screen 36
Figure 2-11 MultiChannel Configuration Screen 37
Figure 2-12 Controller Configuration Screen - IBM Adapters 39
Figure 2-13 IBM Virtual Fabric Mode Configuration Screen 41
Figure 3-1 PXE Boot Process 44
Figure 3-2 Controller List Screen 47
Figure 3-3 Configure Controller Screen 47
Figure 3-4 Port Selection Menu 48
Figure 3-5 Configure Controller Screen – Personality Selection 50
Figure 3-6 Port Selection Menu 51
Figure 3-7 Port Menu Screen 52
Figure 3-8 Channel(s) List Screen 52
Figure 3-9 Configure Channel Screen 53
Figure 3-10 Boot Configuration Screen 53
Figure 3-11 Port Configuration Screen 54
Figure 3-12 Configure Controller Screen – MultiChannel Enabled 56
Figure 3-13 Port Selection Menu 59
Figure 3-14 Port Menu Screen 59
Figure 3-15 Channels List Screen 60
Figure 3-16 Configure Channel Screen 60
Figure 3-17 Controller Configuration Screen - IBM Adapters 62
Figure 3-18 IBM Virtual Fabric Mode MultiChannel Configuration Screen 64
Figure 6-1 Emulex Adapter Listing 88
Figure 6-2 Main Configuration Menu 88
Figure 6-3 BIOS Status 89
Figure 6-4 Devices Present on the Adapter 89
Figure 6-5 List of Saved Boot Devices Screen 90
Figure 6-6 Device Selection List Example Screen 90
Figure 6-7 LUN Listing Screen 91
Figure 6-8 Boot Device Selected 91

Figure 6-9 Boot Devices Menu 92
Figure 6-10 Primary Boot Device Set Up Screen 92
Figure 6-11 FCF Listing 93
Figure 6-12 Save Edited Boot Record Dialog Box 93
Figure 6-13 Advanced Adapter Configuration Menu 94
Figure 6-14 Change Default ALPA Screen 95
Figure 6-15 Change the PLOGI Retry Timer Screen 96
Figure 6-16 Enable or Disable Spinup Delay Screen 97
Figure 6-17 Set Auto Scan Menu 98
Figure 6-18 Enable or Disable EDD 3.0 Screen 99
Figure 6-19 Enable or Disable Start Unit Command Screen 100
Figure 6-20 Enable or Disable Environment Variable Screen 100
Figure 6-21 Enable or Disable Auto Boot Sector Format Screen 101
Figure 6-22 Reset Adapter Configuration to Defaults Screen 103
Figure 8-1 iSCSI Initiator Configuration Menu 106
Figure 8-2 Controller Selection Menu 106
Figure 8-3 Controller Configuration Menu 106
Figure 8-4 Controller Properties Screen 106
Figure 8-5 Network Configuration Screen 107
Figure 9-1 iSCSI Initiator Configuration Screen 108
Figure 9-2 Controller Selection Menu 109
Figure 9-3 Controller Configuration Menu 109
Figure 9-4 Controller Properties Screen 110
Figure 9-5 Controller Properties Screen with Boot Support Pop-up Menu 110
Figure 9-6 Controller Properties Screen with Discover IPv4 Boot Target via DHCP Pop-up Menu 111
Figure 9-7 Controller Properties Screen with MPIO Port Pop-up Menu 112
Figure 9-8 Network Configuration Screen 112
Figure 9-9 Network Configuration Screen with IP Version Pop-up Menu 113
Figure 9-10 Configure VLAN ID/Priority Screen 113
Figure 9-11 Configure IPv4 Address Screen 114
Figure 9-12 DHCP IP Address Dialog Box 115
Figure 9-13 Configure IPv6 Address Screen 115
Figure 9-14 Static IP Address Dialog Box for IPv4 116
Figure 9-15 Static IP Address Dialog Box for IPv6 117
Figure 9-16 Successful Ping Screen 117
Figure 9-17 Port Identification Screen 118
Figure 10-1 Controller Configuration Menu 120
Figure 10-2 Add/Ping iSCSI Target dialog box 120
Figure 10-3 Targets Discovered via SendTargets Screen 121
Figure 10-4 iSCSI Target Configuration Screen 122
Figure 10-5 iSCSI Target Configuration Information 123

Figure 10-6 Edit/Ping iSCSI Target Dialog Box 124
Figure 10-7 One-way Chap Configuration Dialog Box 126
Figure 10-8 Mutual CHAP Configuration Dialog Box 127
Figure 10-9 Successful Ping Screen 128
Figure 10-10 Advanced Target Properties Screen 128
Figure 10-11 LUN Configuration Menu 129
Figure 10-12 DHCP Server Screen 131
Figure 10-13 DHCP Server Scope Options 132
Figure 11-1 Emulex NIC Configuration Utility Network Screen 135
Figure 11-2 Emulex NIC Selection Screen 136
Figure 11-3 Boot Mode Pop-up Menu 138
Figure 11-4 iBFT Configuration Screen 139
Figure 11-5 Network Configuration Screen 141
Figure 11-6 Primary Target Screen 143
Figure 11-7 Personality Selection Screen with Pop-up Menu 146
Figure 11-8 NIC+RoCE Profile Screen with Pop-Up Menu 147
Figure 11-9 Custom Personality Selection Screen 148
Figure 11-10 Controller Configuration Screen 149
Figure 11-11 View Configuration Screen 150
Figure 11-12 Configure SRIOV Screen 151
Figure 11-13 Configure NIC Mode Pop-up Menu 152
Figure 11-14 Controller Configuration Screen 154
Figure 11-15 Multichannel Configuration for Function 0 Screen 155
Figure 11-16 Configure Bandwidth Screen 156
Figure 11-17 Configure LPVID Screen 157
Figure 11-18 Multichannel Mode Dialog Box 158
Figure 11-19 IBM Virtual Fabric Mode Controller Configuration Screen 160
Figure 11-20 IBM Unified Fabric Protocol Mode Controller Configuration Screen 161
Figure 11-21 Switch Independent Mode Controller Configuration Screen 162
Figure 11-22 Port Management Screen 163
Figure 11-23 Feature On Demand Screen 164
Figure 11-24 UEFI Shell with Firmware and Boot Code File 165
Figure 11-25 Emulex Flash Update Utility 166
Figure 11-26 Emulex Flash Update Utility with Directory Name Dialog Box 166
Figure 11-27 Emulex Flash Update Utility with Flash File Name Dialog Box 167
Figure 11-28 Emulex Flash Update Utility, Flash Updating 168
Figure 11-29 Erase Configuration Screen 169
Figure 12-1 Storage Screen 173
Figure 12-2 Controller Configuration Menu Screen 174
Figure 12-3 Controller Configuration Menu Screen with MPIO Configuration Setting Highlighted 175

Figure 12-4 Controller Configuration Menu Screen with Boot Support Setting Highlighted 176
Figure 12-5 Controller Properties Screen 177
Figure 12-6 Network Configuration Screen 178
Figure 12-7 Network Configuration Menu Screen with IP Version Setting Highlighted 179
Figure 12-8 Configure IPV4 Address Screen 180
Figure 12-9 Configure Static IP Address Screen 181
Figure 12-10 Configure IPV6 Address Screen 182
Figure 12-11 Configure IPV6 Address Settings Screen 183
Figure 12-12 Configure VLAN/ID Priority Screen 184
Figure 12-13 iSCSI Target Configuration Screen 186
Figure 12-14 Discovered Targets Screen 188
Figure 12-15 Add/Ping iSCSI Target Screen 189
Figure 12-16 Boot Target Option on the Edit/Ping Target Screen 190
Figure 12-17 Authentication Method Option on the Edit/Ping Target Screen 191
Figure 12-18 Edit/Ping Target Screen 192
Figure 12-19 Successful Target Ping 193
Figure 12-20 Advanced iSCSI Target Information Screen 194
Figure 12-21 LUN Configuration Screen 195
Figure 12-22 iSCSI Target Configuration Screen 196
Figure 12-23 iSNS Configuration Screen 196
Figure 12-24 iSNS Discovery Mode Screen 197
Figure 12-25 iSNS Server Discovery via DHCP Screen 198
Figure 12-26 iSNS Server IP Screen 199
Figure 12-27 Available Servers Screen 199
Figure 12-28 iSNS Server Options Screen 200
Figure 12-29 Erase Configuration Screen 201
Figure 13-1 Exiting the EFI Shell 203
Figure 13-2 Device Manager Screen 203
Figure 13-3 Emulex Adapter Configuration Main Menu 204
Figure 13-4 CEE Record Selection List 205
Figure 13-5 CEE FCF Record Information 206
Figure 13-6 SAN Discovery Targets List 208
Figure 13-7 LUN Listing 208
Figure 13-8 Commit/Discard Change 209
Figure 13-9 Delete Boot Device Screen 210
Figure 13-10 Change Boot Device Order Screen 211
Figure 13-11 Boot Device Order Screen 211
Figure 13-12 Change Boot Device Order Screen 212
Figure 13-13 Change Boot Device Order Screen with Revised Boot Order 212
Figure 13-14 Change Boot Device Order 213

Figure 13-15 PLOGI Retry Timer 214
Figure 13-16 Configure HBA Parameters – Maximum LUNs/Target Field 215
Figure 13-17 Configure HBA Parameters – Boot Target Scan Method Menu 216
Figure 13-18 Configure HBA Parameters – Delay Device Discovery 217
Figure 13-19 Set Adapter Defaults 219
Figure 13-20 Controller Information 220
Figure B-1 Network Installation and Diskless Environment Window 234
Figure B-2 Configure Network Installations Window 235
Figure B-3 Network Installation Dialog Window 235
Figure B-4 Network Installation and Diskless Environment Window with IP Address 236
Figure B-5 Edit Dialog Box 236
Figure B-6 Enabling Network Boot 237
Figure C-1 System Configuration and Boot Management Screen 245
Figure C-2 Boot Manager Screen 246
Figure C-3 File Explorer Screen 247
Figure C-4 ELILO Boot Message 247
Figure C-5 Language Selection Menu 248
Figure C-6 Main Menu 248
Figure C-7 Expert Menu 249
Figure C-8 Kernel Modules (Hardware Drivers) Menu 249
Figure C-9 Driver Update Medium Selection Listing 250
Figure C-10 Driver Update List Dialog Box 250
Figure C-11 Source Medium Selection Menu 250
Figure C-12 Network Protocol Selection Menu 251
Figure C-13 Network Device Selection Listing 251
Figure C-14 NFS Server IP Address Dialog Box 251
Figure C-15 Server Directory Dialog Box 252
Figure C-16 Starting Script 252
Figure C-17 Driver Update Confirmation 252
Figure C-18 UEFI Boot Settings Screen 260
Figure C-19 Boot Manager Main Menu 261
Figure C-20 UEFI Boot Menu 262
Figure C-21 File Explorer Screen 262
Figure C-22 Language Selection Menu 263
Figure C-23 Main Menu 263
Figure C-24 Expert Menu 264
Figure C-25 Kernel Modules (Hardware Drivers) Menu 264
Figure C-26 Driver Update Medium Selection List 265
Figure C-27 Source Medium List 265
Figure C-28 Network Protocol List 266
Figure C-29 Network Device List 266
Figure C-30 Automatic Configuration via DHCP Dialog Box 266

Figure C-31 FTP Server IPv6 Address Dialog Box 267
Figure C-32 Server Directory Path Dialog Box 267
Figure D-1 Partitions Tab 268
Figure D-2 UEFI FCoE Start Options 269
Figure E-1 Driver Listing 270
Figure F-1 Device Settings Page 271
Figure F-2 Main Configuration Page 272
Figure F-3 Firmware Image Properties Page 274
Figure F-4 FCoE Configuration Page 275
Figure F-5 FCoE General Parameters Page 276
Figure F-6 NIC Configuration Page 278
Figure F-7 iSCSI Configuration Page 280
Figure F-8 iSCSI General Parameters Page 281
Figure F-9 iSCSI Initiator Parameters Page 283
Figure F-10 iSCSI First Target Parameters Page 284
Figure F-11 iSCSI Second Target Parameters Page 286
Figure F-12 iSCSI Secondary Device Parameters Page 287
Figure F-13 Device Level Configuration Page 288
Figure F-14 NIC Partitioning Configuration Page 289
Figure F-15 Global Bandwidth Allocation Page 290
Figure F-16 Partition Configuration Page 291
Figure G-1 Controller Selection Menu 294
Figure G-2 Port Selection Menu 294
Figure G-3 Port Configuration Screen 294
Figure G-4 Configure PXE VLAN ID/Priority Menu 297
Figure G-5 Port Identification Screen 297
Figure H-1 Controller List Screen 301
Figure H-2 Controller Configuration Screen 301
Figure H-3 Port Selection Menu 302
Figure H-4 Port Menu 303
Figure H-5 Partition(s) List Screen 303
Figure H-6 Configure Partition Screen 304
Figure H-7 Partition(s) List Screen When NParEP is Enabled 306
Figure H-8 Boot Configuration Screen 306
Figure H-9 Port Configuration Screen 308

List of Tables

Table 2-1 Advanced Mode Capabilities (by Operating System) 33
Table 2-2 PXE Boot Parameter Default Values 42
Table 3-1 PXE Boot Parameter Default Values 65
Table 6-1 Valid AL_PA Values 95
Table 6-2 Default Adapter Boot Parameter Values 102
Table 7-1 Utilities that Update and Enable Boot Code 104
Table 11-1 Advanced Mode Capabilities (by Operating System) 137
Table 13-1 Adapter Default Values 218
Table 14-1 PXE Error Codes 221
Table 14-2 Troubleshooting the iSCSISelect Utility 224
Table 14-3 Troubleshooting the FCoE Protocol 227
Table F-1 Main Configuration Page Menu Options 272
Table F-2 Firmware Image Properties Page Menu Options 274
Table F-3 FCoE Configuration Page Menu Options 275
Table F-4 FCoE General Parameters Page Menu Options 276
Table F-5 NIC Configuration Page Menu Options 278
Table F-6 iSCSI Configuration Page Menu Options 280
Table F-7 iSCSI General Parameters Page Menu Options 281
Table F-8 iSCSI Initiator Parameters Page Menu Options 283
Table F-9 iSCSI First Target Parameters Page Menu Options 284
Table F-10 iSCSI Second Target Parameters Page Menu Options 286
Table F-11 iSCSI Secondary Device Parameters Page Menu Options 287
Table F-12 Device Level Configuration Page Menu Options 288
Table F-13 NIC Partitioning Configuration Page Menu Options 289
Table F-14 Global Bandwidth Allocation Page Menu Options 290
Table F-15 Partition Configuration Page Menu Options 291
Table G-1 PXE Boot Parameter Default Values 299
Table H-1 PXE Boot Parameter Default Values 310

1. Introduction

Overview

This manual describes installing, enabling, and configuring boot code for Emulex® network interface card (NIC), Internet Small Computer System Interface (iSCSI), and Fibre Channel over Ethernet (FCoE) adapters. This manual also describes the Emulex boot from SAN implementation and its operation with distinct hardware and operating system requirements.

Boot from SAN is the process of booting a server directly from a disk operating system image located on a storage area network (SAN) by way of Emulex adapters using Emulex boot code. When booting from SAN, the storage device is typically identified by its world wide port name (WWPN) and a logical unit number (LUN). By extending the server system boot basic input/output system (BIOS), boot from SAN functionality is provided by the boot BIOS contained on an Emulex adapter in the server. When properly configured, the adapter then permanently directs the server to boot from a logical unit (disk) on the SAN as if it were a local disk.

Emulex provides the following types of boot code:

- Preboot eXecution Environment (PXE) boot for NIC adapters in x86 and x64 systems
- x86 BootBIOS for FCoE adapters in x86 and x64 systems
- iSCSI boot for iSCSI adapters in x86 and x64 systems
- UEFIBoot for NIC, iSCSI, and FCoE adapters in x64 systems. This provides system boot capability through the use of the UEFI (Unified Extensible Firmware Interface) Shell. It also functions on UEFI 2.x-based platforms through the HII (Human Interface Infrastructure) interface.
- OpenBoot for FCoE and NIC adapters in Sun SPARC systems (OpenBoot is also called FCode). For more information, see chapter 4., "Configuring Boot from SAN for the FCoE Protocol," on page 67 and appendix I., "Booting the Solaris Operating System from the Network on SPARC Systems," on page 312.

Note: Emulex drivers support multipath boot configurations. See your storage vendor's documentation for information on configuring multipath booting.

The Emulex boot code and the following utilities provide a variety of capabilities:

- Boot from SAN across the different networking protocols and operating systems
- UEFI configuration using the Emulex NIC, FCoE, and iSCSI Configuration Utilities
- PXESelect Utility
  - Configuring the port and controller
  - Configuring multichannel support and personality options
- FCoE Boot BIOS Utility
  - Scanning for target devices

  - Configuring boot devices and advanced adapter parameters
- iSCSISelect Utility
  - Setting up a basic configuration
  - Configuring and managing iSCSI initiators and targets

The boot code is distributed in the same image used to flash the firmware. Several methods are available for flashing the firmware and boot code image. See the documentation accompanying each utility for additional information on the flash procedure.

Abbreviations

ACL	Access Control List
AL_PA	Arbitrated Loop Physical Address
API	application programming interface
ARI	alternative routing-ID interpretation
ARP	Address Resolution Protocol
BBS	BIOS Boot Specification
BFS	boot from SAN
BIOS	basic input/output system
BOFM	Blade Open Firmware Management Protocol
CEE	Converged Enhanced Ethernet
CHAP	Challenge Handshake Authentication Protocol
CLI	command line interface
DCB	Data Center Bridging
DCBX	Data Center Bridging Exchange Protocol
DHCP	Dynamic Host Configuration Protocol
DID	device ID
DMA	direct memory access
DNS	Domain Name System
EDD	Enhanced Disk Device
EFI	Extensible Firmware Interface
FC	Fibre Channel
FC-AL	Fibre Channel Arbitrated Loop
FCF	FC Forwarder
FCoE	Fibre Channel over Ethernet
FL_Port	fabric loop port
FMP	Firmware Management Protocol
FoD	Feature on Demand

FTP	File Transfer Protocol
FUI	FoD Unique Identifier
Gb/s	gigabits per second
GPT	GUID partition table
GUI	graphic user interface
GUID	Globally Unique Identifier
HBA	host bus adapter
HII	Human Interface Infrastructure
HTTP	Hypertext Transfer Protocol
IEEE	Institute of Electrical and Electronics Engineers
iBFT	iSCSI boot firmware table
INTx	PCIe legacy interrupts, where "x" is variable
I/O	input/output
IOCTL	input/output control
IP	internet protocol
IQN	iSCSI qualified name
iSCSI	Internet Small Computer System Interface
JBOD	just a bunch of disks
KB	1024 bytes (Kilobyte or Kibibyte)
LACP	Link Aggregation Control Protocol
LDAP	Lightweight Directory Access Protocol
LED	light-emitting diode
LOM	LAN on motherboard
LPVID	logical port VLAN ID
LUN	logical unit number
MAC	media access control
MBR	master boot record
MPIO	multipath I/O
MSI	message signaled interrupts
MSI-X	message signaled interrupts - extended
MTU	maximum transmission unit
NBP	network bootstrap program
NIC	network interface card (or controller)
NIS/NIS+	Network Information Service/Network Information Service Plus
NIV	Network Interface Virtualization
NLB	network loopback
NPAR	NIC partitioning

NPIV	N_Port ID virtualization
NVRAM	non-volatile random-access memory
OCM	OneCommand Manager
OEM	original equipment manufacturer
OS	operating system
PCI	Peripheral Component Interconnect
PCIe	Peripheral Component Interconnect Express
PDU	protocol data unit
PF	physical function
PLOGI	port login
POST	power on self test
PXE	Preboot eXecution Environment
QoS	quality of service
RAID	redundant array of independent disks
RDMA	remote direct memory access
RHEL	Red Hat Enterprise Linux
RIS	Remote Installation Services
RoCE	RDMA over Converged Ethernet
ROM	read-only memory
RPM	resource package manager
RSS	receive side scaling
SAN	storage area network
SCSI	Small Computer System Interface
SLES	SUSE Linux Enterprise Server
SLI	Service Level Interface
SNP	Simple Network Protocol
SR-IOV	single root I/O virtualization
SVID	service VLAN ID
TB	terabyte
TCP	transmission control protocol
TFTP	Trivial File Transfer Protocol
UCM	Universal Configuration Manager
UCNA	universal converged network adapter
UDP	User Datagram Protocol
UFP	Unified Fabric Protocol
UEFI	Unified Extensible Firmware Interface
UMC	universal multichannel

UNDI	Universal Network Device Interface
USB	Universal Serial Bus
VF	virtual function
VLAN	virtual local area network
VM	virtual machine
VMQ	virtual machine queue
vNIC	virtual NIC
WDS	Windows Deployment Services
WWN	world wide name
WWNN	world wide node name
WWPN	world wide port name
x	Used to designate a variable. For example, SP*x* includes SP1, SP2, etc.
ZB	zettabyte

2. Configuring PXE Boot for NIC on LPe16202, OCe10100, and OCe11100-series Adapters

Note: This section applies to LPe16202, OCe10100, and OCe11100-series adapters. See chapter 3., "Configuring PXE Boot for NIC on OCe14000-series Adapters," on page 43 for information specific to those adapters.

Note: The LPe16202 adapter may be reported as an OCe15100 adapter by certain applications.

This section describes using and configuring PXE to boot computers using a network interface independent of available data storage devices (such as hard disks) or installed operating systems.

The PXE protocol is a combination of DHCP and TFTP with subtle modifications to both. DHCP locates the appropriate boot server or servers, and TFTP downloads the initial bootstrap program and additional files.

Network booting enables you to perform the following tasks:

- Boot diskless systems such as thin clients and dedicated systems.
- Deploy software and operating systems for your systems.
- Automate system maintenance, such as backups.
- Automate system checking, such as virus scanning.
- Ensure a system is secure.

Pre-OS

PXE can be used in a "pre-OS" environment. Pre-OS is the process of loading a small operating environment to perform a client management task before loading the final operating system from the local hard drive. For example, with a pre-OS you can scan the hard drive for viruses. This guarantees that the client is not infected before it starts. The WDS uses this to install operating systems on local disks or BFS disks.

PXE Boot Process

Once PXE Boot is enabled in the system UEFI/BIOS, the PXE client can boot up and start up the PXE boot ROM. This is the boot code physically located on the NIC adapter.

Note: To enable or disable PXE Boot, it must be enabled or disabled in the system UEFI/BIOS; see the documentation that accompanied the server for more information.

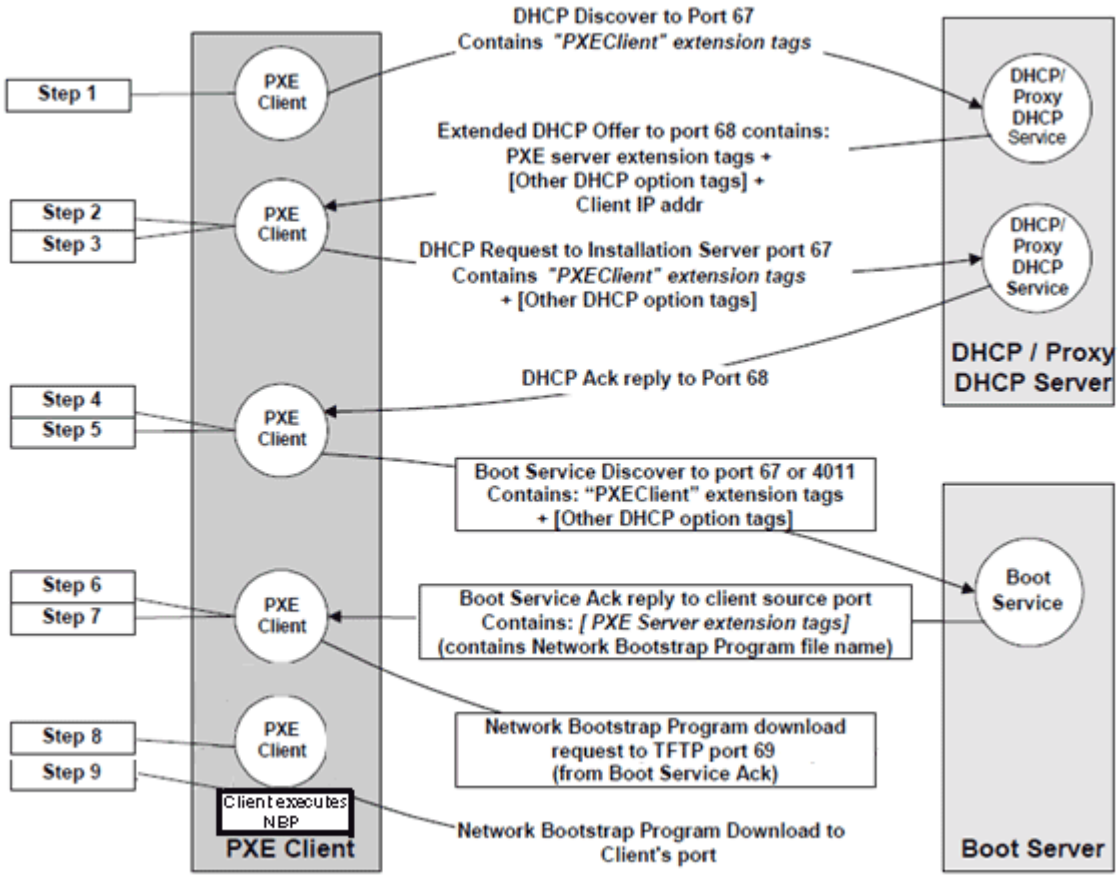

Figure 2-1 PXE Boot Process

Figure 2-1 shows the boot process.

1. The PXE boot ROM sends a DHCP request extended with PXE specific options (step 1 in the figure).
2. The DHCP responses contain the DHCP options (DHCPOFFERs) that include the NBP filename and boot server lists (steps 2 through 5).
3. The PXE client attempts to download the specified NBP over TFTP from one of the specified boot servers (steps 6 and 7).
4. The PXE client executes the downloaded NBP (steps 8 and 9).

Note: If any of these steps fail, the boot process typically continues using the next available device in the boot sequence, depending on the system configuration and boot order.

Remotely Installing with PXE for Windows Server 2008, 2008 R2, 2012, and 2012 R2

For remote installation with PXE, a network driver for the Emulex adapter must be part of the client's installation image on the server. The current versions of Windows Server 2008 and Windows Server 2008 R2 do not include network drivers for the Emulex adapter; however, Windows Server 2012 and 2012 R2 include the network driver for the Emulex adapter.

To add the image and installation using the driver with the Remote Installation Service Setup, select:

Start Menu > Programs > Administrative Tools Remote Installation Services Setup

(For more information, refer to *Microsoft Article ID Q246184 - How to Add Third-Party OEM Network Adapters to RIS Installations*.)

In addition to the network driver for the Emulex adapter, you must configure the following services to use PXE for remote installations:

- DHCP server
- Remote Installation Services
- Windows Deployment Services

Microsoft provides extensive documentation on deploying its operating systems for remote installations, and different setups may be required depending on your individual implementation. Microsoft provides step-by-step guides for its Windows Deployment Services for configuring your server, adding images, and installing an operating system. It also includes instructions for more advanced tasks like creating multicast transmissions, creating custom images, and performing an unattended installation.

For detailed information on deploying and managing remote installations on Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2, see the Microsoft website and visit Microsoft TechNet. Search on the bulleted terms above to access Microsoft's wide-ranging documentation on these subjects.

Remotely Installing with PXE for Linux and Citrix Servers

Linux allows for PXE installation over a network using the NFS, TFTP, or HTTP protocols. If the system to be installed contains an Emulex NIC or adapter with PXE Boot support, it can be configured to boot from files on another networked system rather than local media.

The Linux distributions provide extensive documentation on deploying and managing remote installations of the Linux operating system via PXE. See your appropriate distribution's documentation for instructions on how to deploy a PXE installation over your network.

For remote installation with PXE, a network driver for the Emulex adapter must be part of the client's installation image on the server. Your current Linux distribution may or may not include network drivers for Emulex adapters. If they do, the driver may need to be added to your operating system's installation image, or added during installation. See your appropriate distribution's documentation for instructions on how to add drivers during installation.

Using the PXESelect Utility

Note: If you are using Dell adapters, refer to appendix G., "Configuring PXE Boot for NIC on Dell OCe10100-based Systems," on page 293 for information on using the PXESelect utility.

Navigating the PXESelect Utility

Use the following methods to navigate the PXESelect utility:

- Press the up/down arrows on your keyboard to move through and select menu options or configuration fields. When multiple adapters are listed, use the up/down arrows to scroll to the additional adapters.
- Press **<Tab>** to move to the next field or to select a row in a configuration screen. Use **<Shift> <Tab>** to move to the previous field.
- Press **<Enter>** to accept a selection, select a menu option, or to change a configuration default.
- Press **<Esc>** to return to the previous menu or page, cancel a selection or dialog box, or exit the utility.

Running the PXESelect Utility

To run the PXESelect utility, start or restart your computer. When prompted, hold down **<Ctrl>** and press **<P>**. If you are running the PXESelect utility with multiple controllers, all your controllers are displayed when you start the utility. For example:

```
Press <Ctrl><P> for PXESelect(TM)Utility

Controller#0 Port#0 Base 0xFCE60000 at Bus:05 Dev:00 Fun:00
Controller#0 Port#1 Base 0xFCEA0000 at Bus:05 Dev:00 Fun:01
Controller#1 Port#0 Base 0xFC920000 at Bus:01 Dev:00 Fun:00
Controller#1 Port#1 Base 0xFC960000 at Bus:01 Dev:00 Fun:01
- Initializing ...Done.
```

The PXE Configuration menu appears after the boot BIOS initializes to begin your PXE configuration.

Note: A UEFI-capable system typically does not display the prompt for running the PXESelect utility unless it is configured for legacy booting. See your system configuration manual for information on performing a legacy boot. All configuration that can be performed in the PXESelect utility can instead be

performed in the UEFI configuration utility. See chapter 11., "Configuring UEFI for Ethernet," on page 134 for more information.

Setting Up a PXE Bootable Network

After the PXE boot BIOS initializes, you can use the PXESelect utility to set up a PXE bootable network by configuring your controllers.

To configure controllers for PXE boot:

1. At the Controller Selection Menu, use the **<Tab>** key to select the controller you want to configure and press **<Enter>**.

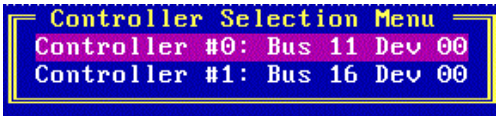

Figure 2-2 Controller Selection Menu

Note: The Controller Selection Menu only appears if there are two or more adapters connected.

The Controller Configuration menu appears.

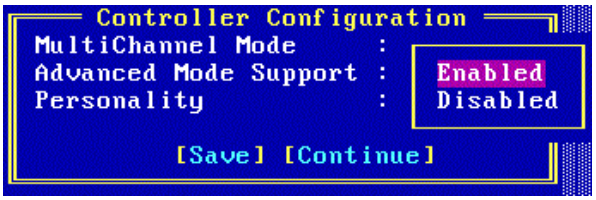

Figure 2-3 Controller Configuration Menu

Depending on the adapter, one or more of the following options will be displayed:

- MultiChannel Mode – when multichannel is enabled, you can access up to eight virtual network interfaces.
- For additional information on Multichannel Mode, see "Configuring Universal Multichannel" on page 37.

  Note: If you are using an IBM adapter, see "Configuring Multichannel for IBM Adapters" on page 39 for additional information on Multichannel Mode.

  Note: A reboot will occur when you exit the PXESelect utility if the Multichannel Mode has changed since the last boot.

- Advanced Mode Support – Advanced Mode support is enabled by default on OCe11100-series 2-port and 4-port controllers and the LPe16202/OCe15100 converged fabric adapter (CFA). Advanced Mode support enables you to run Advanced Mode-aware drivers that provide advanced capabilities. For additional information on configuring Advanced Mode, see "Advanced Mode Support" on page 32.

  Note: On 4-port controllers, the Advanced Mode setting is not provided in the PXESelect utility.

- Personality – This option specifies a list of available protocols that can be configured on an adapter. For additional information on adapter personality, see "Personality Option" on page 30.

  Note: Changing the Personality setting requires a reboot before the change will take effect. A reboot will occur when you exit the PXESelect utility if the Personality setting has changed since the last boot.

2. Once you have set the options in the Controller Configuration menu, select **Save** and press **<Enter>**.
3. To proceed, select **Continue** and press **<Enter>**.

   The Port Selection Menu appears.
4. Select the port you want to configure and press **<Enter>**.

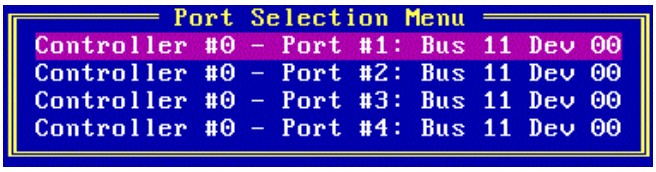
Port Selection Menu
Controller #0 - Port #1: Bus 11 Dev 00
Controller #0 - Port #2: Bus 11 Dev 00
Controller #0 - Port #3: Bus 11 Dev 00
Controller #0 - Port #4: Bus 11 Dev 00

Figure 2-4 Port Selection Menu

Note: The Port Selection Menu only appears if there are two or more ports connected.

Depending on your installed adapter and the Multichannel Mode setting, proceed to the following sections:

- If Multichannel Mode is disabled, or it is not supported, refer to "Configuring Ports When Multichannel is Disabled or Not Supported" on page 34 for additional configuration information.
- If Multichannel Mode is enabled, refer to "Configuring Universal Multichannel" on page 37 for additional configuration information.
- If Multichannel Mode is enabled and you are using IBM adapters, refer to "Configuring Multichannel for IBM Adapters" on page 39 for additional configuration information.

Personality Option

The "personality" reflects the protocol, or protocols, of the adapter. This option specifies a list of available protocols that can be configured on an adapter. Depending on the personalities for which the adapter is licensed, one of the following selections appears:

- NIC
- iSCSI
- FCoE
- Custom

The menu only displays the available personalities, including both free and licensed personalities.

The NIC personality implies that all the enabled functions provide NIC/TOE functionality.

Note: TOE is not supported on LPe16202/OCe15000-series adapters.

iSCSI and FCoE personalities are enabled on one function per adapter port and include NIC functionality on the other enabled functions. There can be only one storage protocol on each port.

For information about custom personalities, see "Configuring the Custom Personality Selection" on page 31.

To select the personality of the adapter:

1. From the Controller Configuration menu, use the **<Tab>** key to select **Personality** and a pop-up menu appears.

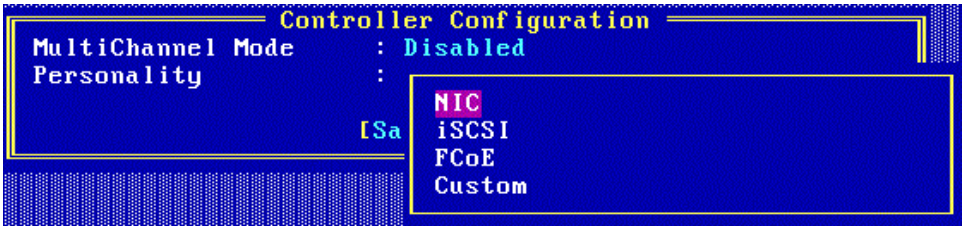

Figure 2-5 Controller Configuration Menu – Personality Selection

2. Select **NIC, iSCSI**, **FCoE**, or **Custom** and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

   Note: Changing the Personality setting requires a reboot before the change will take effect. A reboot will occur when you exit the PXESelect utility if the Personality setting has changed since the last boot.

Configuring the Custom Personality Selection

The Custom personality allows you to select the protocol type for each function (0–7). iSCSI and FCoE personalities may only be enabled on one function per adapter port.

Note: There cannot be two iSCSI functions and two FCoE functions on a single port.

To select the Custom personality:

1. From the Controller Configuration menu, use the **<Tab>** key to select **Personality** and a pop-up menu appears.
2. Select **Custom** and press **<Enter>**.

3. If multichannel is enabled, on the Multichannel Configuration screen select the specific function and press **<Enter>**. A pop-up menu is displayed.

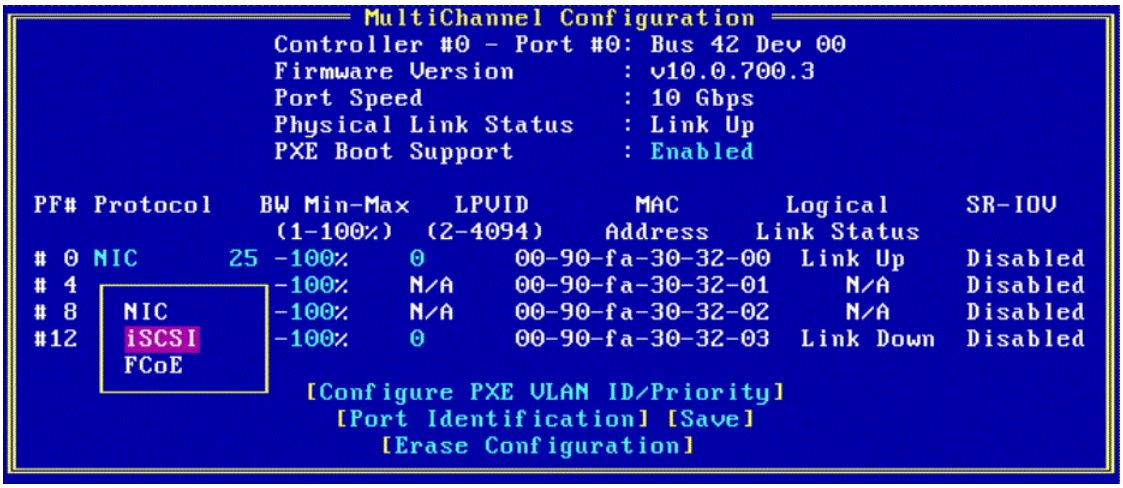
MultiChannel Configuration
Controller #0 - Port #0: Bus 42 Dev 00
Firmware Version : v10.0.700.3
Port Speed : 10 Gbps
Physical Link Status : Link Up
PXE Boot Support : Enabled
PF# Protocol BW Min-Max (1-100%) LPVID (2-4094) MAC Address Logical Link Status SR-IOV
0 NIC 25 -100% 0 00-90-fa-30-32-00 Link Up Disabled
4 -100% N/A 00-90-fa-30-32-01 N/A Disabled
8 -100% N/A 00-90-fa-30-32-02 N/A Disabled
#12 -100% 0 00-90-fa-30-32-03 Link Down Disabled
NIC
iSCSI
FCoE
[Configure PXE VLAN ID/Priority]
[Port Identification] [Save]
[Erase Configuration]

Figure 2-6 Custom Personality Selection on Multichannel Configuration Screen

Note: If multichannel is disabled, on the Port Configuration screen select the specific function and press **<Enter>**. A pop-up menu is displayed.

4. Select the desired personality for the appropriate function and press **<Enter>**.

   As mentioned previously for the Custom personality, iSCSI and FCoE personalities may only be enabled on one function per adapter port.

5. Select **Save** and press **<Enter>**.

Note: Changing the Personality setting requires a reboot before the change will take effect. A reboot will occur when you exit the PXESelect utility if the Personality setting has changed since the last boot.

Advanced Mode Support

Advanced Mode is a driver compatibility option. With Advanced Mode enabled, you can run Advanced Mode-aware drivers that provide advanced capabilities as listed in Table 2-1. With Advanced Mode disabled, you can run older legacy inbox drivers that are not Advanced Mode-aware with the latest firmware versions.

Note: Advanced Mode support is enabled by default on OCe11100-series 2-port and 4-port controllers and the LPe16202/OCe15100 CFA. On 4-port controllers, the Advanced Mode setting is not provided in the PXESelect/HII utilities. The Advanced Mode setting on these platforms is implicitly enabled and Advanced Mode-aware drivers must be installed. Compatibility with legacy drivers requires that Advanced Mode support be disabled on 2-port controllers.

Note: Advanced Mode is not supported on OCe10100-series controllers.

Table 2-1 Advanced Mode Capabilities (by Operating System)

Operating System	Advanced Mode Enabled	Advanced Mode Disabled (Legacy Mode)
Windows	16 RSS queues **Note:** Only supported on Windows Server 2008 R2, 2012, and 2012 R2. Remains four queues for earlier Windows versions.	4 RSS Queues
	VMQ lookahead split **Note:** VMQs are only supported on Windows Server 2008 R2 and later versions.	Lookahead split is silently ignored. There may be a small performance penalty for VMQs.
Linux and Citrix	16 RSS Queues	4 RSS Queues
	VFs/PFs can be increased up to 30	
VMware ESXi	For both 1500 and 9000 MTU: 16 NetQueues/PFs in non-VFA 4 NetQueues/PFs in VFA	1500 MTU – 8 NetQueues/PFs in non-VFA and 4 NetQueues/PFs in VFA. 9000 MTU – 4 NetQueues/PFs in both VFA and non-VFA

To configure Advanced Mode support:

1. From the Controller Configuration menu, use the **<Tab>** key to select **Advanced Mode Support** and a pop-up menu appears.

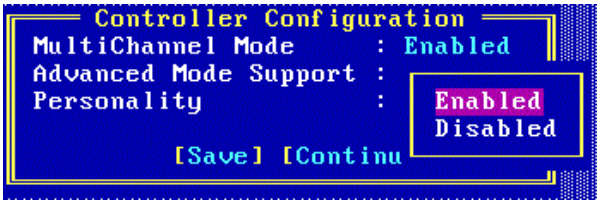

Figure 2-7 Controller Configuration Menu – Advanced Mode Support Selection

2. Select **Enabled** or **Disabled** and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

Configuring Ports When Multichannel is Disabled or Not Supported

Note: If your adapter has multichannel enabled, refer to "Configuring Universal Multichannel" on page 37. If you are using an IBM adapter, refer to "Configuring Multichannel for IBM Adapters" on page 39.

If Multichannel Mode is disabled, or if it is not supported, the Port Configuration screen appears after you select a port in the Port Selection Menu.

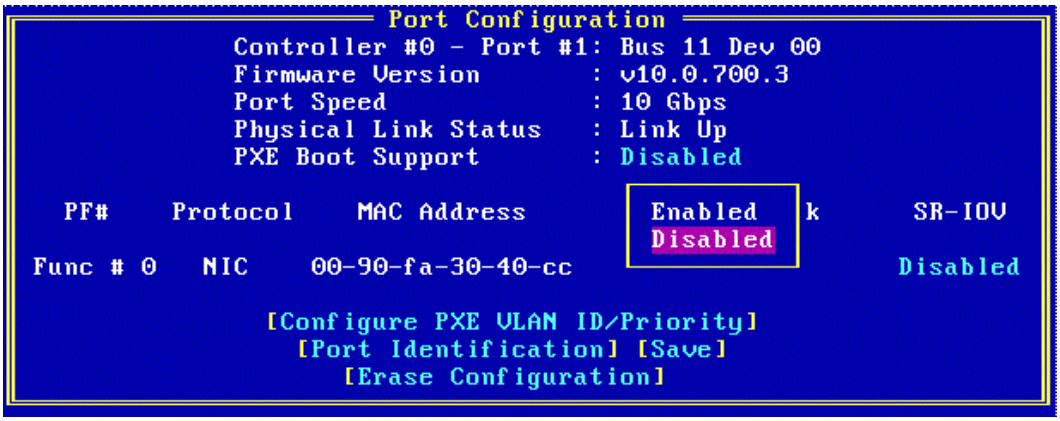

Figure 2-8 Port Configuration Screen

Note: Logical Link Status is displayed as "N/A" for storage functions.

The Port Configuration screen enables you to perform the following tasks:

- Configure PXE boot support
- Configure SR-IOV
- Configure PXE VLAN ID and Priority
- Identify ports
- Erase the port and adapter configuration

Configuring PXE Boot Support

To configure PXE boot support:

1. On the configuration screen, use the **<Tab>** key to select the PXE Boot Support setting and a pop-up menu appears.
2. Select **Enabled** or **Disabled** and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

Note: During system startup, PXE contacts the DHCP server for an IP address to boot from the network.

Configuring SR-IOV

If your system BIOS supports SR-IOV, you can enable it on the adapter. SR-IOV support can only be enabled when multichannel is disabled or not supported. For more information on SR-IOV configuration, see the appropriate Emulex driver manual.

To configure SR-IOV:

1. On the configuration screen, use the **<Tab>** key to select the SR-IOV setting and a pop-up menu appears.
2. Select **Enabled** or **Disabled** and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

Configuring the PXE VLAN ID and Priority

To configure a PXE VLAN ID and set the priority level:

1. On the configuration screen, select **Configure PXE VLAN ID/Priority** and press **<Enter>**. The Configure PXE VLAN ID/Priority menu is displayed.

Figure 2-9 Configure PXE VLAN ID/Priority Menu

2. Use the **<Tab>** key to select the PXE VLAN Support setting and a pop-up menu appears.
   a. For PXE VLAN Support, select **Enabled** and press **<Enter>**.
   b. For the PXE VLAN ID, enter a number from 0-4094 and press **<Enter>**.
   c. For the PXE VLAN Priority level, enter a number from 0-7 and press **<Enter>**. This unique value assigns a priority to outbound packets containing a specified VLAN ID. Valid values range from 0-7, with 0 the highest priority level.
3. Select **Save** and press **<Enter>**.

After you exit the PXESelect utility, the system will reboot for the configuration to take effect.

Physically Identifying the Port

To physically determine which port you are configuring by causing the link and activity LEDs of that port to blink:

1. On the configuration screen, select **Port Identification** and press **<Enter>**. The Port Identification screen appears.

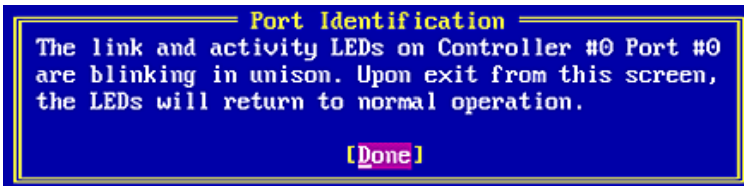
Port Identification
The link and activity LEDs on Controller #0 Port #0
are blinking in unison. Upon exit from this screen,
the LEDs will return to normal operation.
[Done]

Figure 2-10 Port Identification Screen

2. The LEDs on your controller begin blinking. The selected port's LED status indicators blink on your controller until you select **Done** on this screen and press **<Enter>**.

Note: Not all controllers have LEDs that are visible externally. If you are using an add-in card in a blade server environment, the port identification or beaconing capability does not work.

Erasing Ports and Controller Configuration

Note: When this setting is selected, all previous configuration settings are returned to their factory default settings except for the current personality selection. Emulex recommends performing this action to provide a clean environment for new configuration settings to take effect.

To erase the ports and controller configuration:

1. On the configuration screen, select **Erase Configuration** and press **<Enter>**. A warning appears asking if you want to erase the current configuration for all ports of the controller.
2. Press **<Y>** to delete the configuration. You will receive another warning asking you to confirm the permanent removal of the controller configuration.
3. Press **<Y>** to delete the configuration.

To exit the PXESelect utility after erasing the ports and controller configuration:

1. Follow the instructions on the bottom of the individual menu screens until you are prompted to exit.
2. Press **<Y>** to exit. Depending on the settings that were changed, a reboot may be necessary.

   Note: For older systems, depending on the memory allocation method supported, the PXESelect utility automatically reboots even when there are no changes made to the system.

Configuring Universal Multichannel

Note: UMC support is only available on OCe11100-series adapters.

Note: If your adapter has multichannel enabled and also supports IBM Virtual Fabric Mode or IBM Unified Fabric Protocol Mode, refer to "Configuring Multichannel for IBM Adapters" on page 39 for additional information. If multichannel is disabled or not supported on the adapter, refer to "Configuring Ports When Multichannel is Disabled or Not Supported" on page 34.

UMC provides the ability to configure multiple physical functions or I/O channels for each physical adapter port. For additional information on UMC support, see the *Emulex Universal Multichannel Reference Guide*.

Note: When UMC is enabled, you must configure the multichannel settings (minimum and maximum bandwidths) for iSCSI and FCoE storage functions in the NIC BIOS before they can be configured further from their respective utilities (iSCSI or FCoE BIOS). Otherwise, the Logical Link for that function will still show as down, and you will not be able to log into targets or find LUNs behind those targets.

Note: Multichannel functionality is only supported on OneConnect adapters running in 10 Gb mode. The 1 Gb mode does not support UMC.

To view the MultiChannel Configuration screen:

1. From Port Selection Menu (Figure 2-4), select the port you want to configure and press **<Enter>**. The MultiChannel Configuration screen appears.

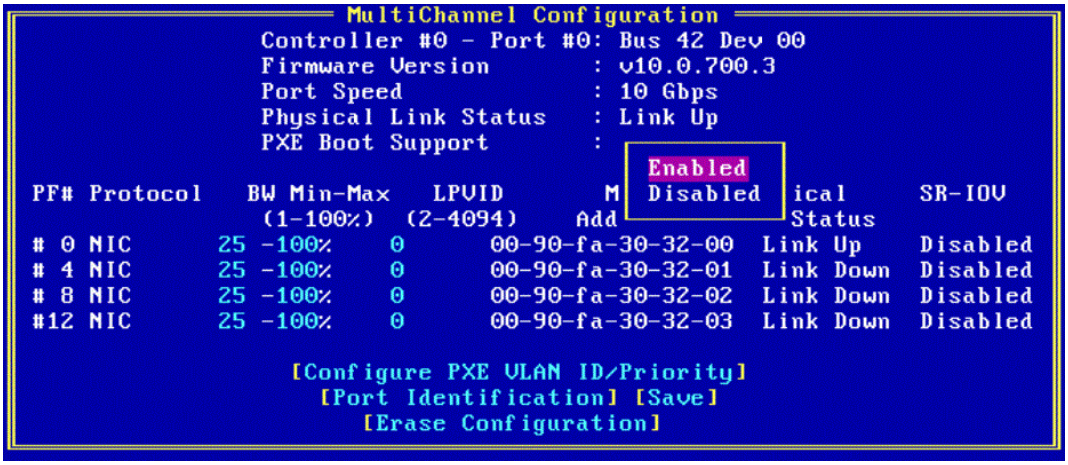
MultiChannel Configuration
Controller #0 - Port #0: Bus 42 Dev 00
Firmware Version : v10.0.700.3
Port Speed : 10 Gbps
Physical Link Status : Link Up
PXE Boot Support :
Enabled
Disabled
PF# Protocol BW Min-Max (1-100%) LPVID (2-4094) MAC Address ical Status SR-IOV
0 NIC 25 -100% 0 00-90-fa-30-32-00 Link Up Disabled
4 NIC 25 -100% 0 00-90-fa-30-32-01 Link Down Disabled
8 NIC 25 -100% 0 00-90-fa-30-32-02 Link Down Disabled
#12 NIC 25 -100% 0 00-90-fa-30-32-03 Link Down Disabled
[Configure PXE VLAN ID/Priority]
[Port Identification] [Save]
[Erase Configuration]

Figure 2-11 MultiChannel Configuration Screen

Notes:

- Logical Link Status is displayed as "N/A" for storage functions.
- SR-IOV support can only be enabled if UMC support is disabled.
- If your system does not support some of the multichannel options, those unavailable options appear as N/A on the MultiChannel Configuration screen.

2. From the MultiChannel Configuration screen, you can perform the following tasks:
   - Configure PXE boot support – see "Configuring PXE Boot Support" on page 34 for instructions.
   - Configure PXE VLAN ID/Priority – see "Configuring the PXE VLAN ID and Priority" on page 35 for instructions.
   - Identify ports – see "Physically Identifying the Port" on page 36 for instructions.
   - Erase the port and adapter configuration – see "Erasing Ports and Controller Configuration" on page 36 for instructions.
   - Configure the minimum and maximum bandwidth for each channel.
   - Configure the LPVID for each channel.

Note: Your adapter or system may not support all multichannel options.

Configuring Minimum and Maximum Bandwidth

To configure bandwidth:

1. On the configuration screen, use the **<Tab>** key to select **Minimum Bandwidth** or **Maximum Bandwidth**.
   - The Minimum Bandwidth value is the least amount of bandwidth that the function can provide. It is represented as a percentage. The Minimum Bandwidth value must be less than or equal to the Maximum Bandwidth value. The total of the Minimum Bandwidth values for all enabled functions on that port must be equal to 100.

     Note: A Minimum Bandwidth value of 0 is a valid value. When all of the partitions' Minimum Bandwidth values are zero, the bandwidth is distributed equally among the current active partitions. If a specific partition's Minimum Bandwidth and Maximum Bandwidth values are 0, that partition's logical link will be brought down.

   - The Maximum Bandwidth value is the greatest amount of bandwidth that the function can provide. It is represented as a percentage.
2. Enter the value for the specified option and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

Configuring LPVID

The LPVID is used to enforce a VLAN ID on all traffic originating from an IP address, channel, or PCI function. If the operating system for that PCI function has set up a VLAN ID, then the operating system-configured VLAN ID takes precedence over the LPVID for transmit packets while the operating system-configured VLAN ID and LPVID-tagged packets will both be received. If the operating system has not set up any VLAN IDs, then the LPVID is used for tagging.

Note: LPVID and user-configured VLAN IDs from the operating system must be different.

Note: LPVIDs also need to be configured on the switch port.

Each LPVID must be unique and is relevant for NIC traffic only. The LPVID is not supported for storage functions. For iSCSI storage functions, you must configure a VLAN ID through iSCSISelect or through the host. For additional information, see "Configuring VLAN ID and VLAN Priority" on page 113.

During PXE boot when the UNDI Driver (BIOS) is functional, the PXE VLAN is used. However, once the NIC driver is operational the LPVID is used.

Note: If no PXE VLAN is configured, the LPVID is used.

For example:

```
PXE Install OS
PXE Server configured with VLAN 5
PXE VLAN=5
LPVID for function 0=5
```

To configure LPVID:

1. On the configuration screen, use the **<Tab>** key to select **LPVID** and a dialog box appears.
2. Enter a value and press **<Enter>**. The LPVID range is 2-4094. A value of 0 disables the LPVID.
3. Select **Save** and press **<Enter>**.

Configuring Multichannel for IBM Adapters

Note: This section only pertains to certain Emulex OneConnect adapters that support IBM Virtual Fabric multichannel or Unified Fabric Protocol.

When you want to enable multichannel on IBM adapters, you must select a Multichannel Mode.

To select the Multichannel Mode:

1. From the Controller Configuration menu, use the **<Tab>** key to select the Multichannel Mode setting and a pop-up menu appears.

Figure 2-12 Controller Configuration Screen - IBM Adapters

2. Select one of the following settings and press **<Enter>**:
   - Switch Independent Mode
   - IBM Virtual Fabric Mode
   - IBM Unified Fabric Protocol Mode
   - Disabled

Note: For more information on the available Multichannel Modes, see "Multichannel Modes".

3. Select **Save** and press **<Enter>**.
4. To proceed, select **Continue** and press **<Enter>**.

With the Multichannel Mode selected, you can now configure multichannel support. See "Multichannel Configuration" for more information.

Multichannel Modes

Note: The following modes are only available on IBM adapters and systems that support IBM Virtual Fabric and Unified Fabric Protocol modes.

An IBM Virtual Fabric-enabled switch provides the ability to configure an LPVID for a virtual channel or I/O channel on an adapter port. If multichannel is supported on your system, the PXESelect utility enables you to select one of the following modes:

- IBM Virtual Fabric Mode – select this mode when a OneConnect adapter is attached to an IBM Virtual Fabric-enabled switch.
- IBM Unified Fabric Protocol Mode – select this mode when a OneConnect adapter is attached to an IBM UFP-enabled switch.

Note: Some IBM switches support both UFP and IBM Virtual Fabric Mode.

- Switch Independent Mode – select this mode if you are using a switch other than an IBM Virtual Fabric or UFP-enabled switch. When this mode is enabled, refer to "Configuring Universal Multichannel" on page 37 for information on configuring multichannel.

Note: Multichannel functionality is only supported on OneConnect adapters running in 10 Gb mode. The 1 Gb mode does not support multichannel.

Multichannel Configuration

Multichannel provides the ability to configure multiple PCI functions or I/O channels for each physical adapter port.

Note: Setting up IBM Virtual Fabric or UFP multichannel depends on cooperation with adjacent switches.

Note: Refer to "Configuring Universal Multichannel" on page 37 for information on configuring multichannel when Switch Independent mode is enabled.

To view the configuration screen:

1. From Port Selection Menu (Figure 2-4), select the port you want to configure and press **<Enter>**. The configuration screen appears.

   When configuring multichannel on adapters that support IBM Virtual Fabric and UFP modes, the configuration screen will depend on the Multichannel Mode that has been selected.

Note: For illustration purposes, the screen displays in this section are for a system with IBM Virtual Fabric Mode enabled.

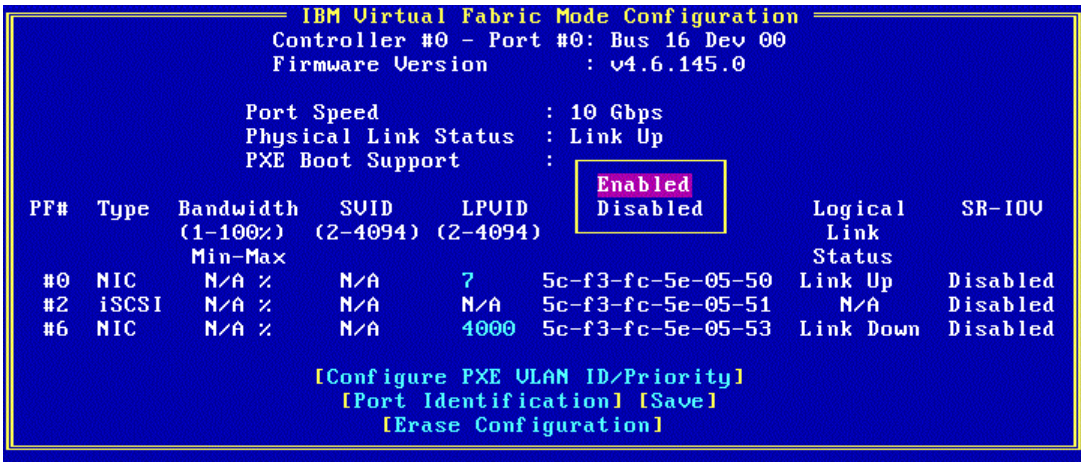
IBM Virtual Fabric Mode Configuration
Controller #0 - Port #0: Bus 16 Dev 00
Firmware Version : v4.6.145.0
Port Speed : 10 Gbps
Physical Link Status : Link Up
PXE Boot Support :
Enabled
Disabled
PF# Type Bandwidth (1-100%) Min-Max SVID (2-4094) LPVID (2-4094) Logical Link Status SR-IOV
#0 NIC N/A % N/A 7 5c-f3-fc-5e-05-50 Link Up Disabled
#2 iSCSI N/A % N/A N/A 5c-f3-fc-5e-05-51 N/A Disabled
#6 NIC N/A % N/A 4000 5c-f3-fc-5e-05-53 Link Down Disabled
[Configure PXE VLAN ID/Priority]
[Port Identification] [Save]
[Erase Configuration]

Figure 2-13 IBM Virtual Fabric Mode Configuration Screen

Notes:

- Logical Link Status is displayed as "N/A" for storage functions.
- SR-IOV support can only be enabled if multichannel support is disabled.
- If your system does not support some of the multichannel options, those unavailable options are displayed as N/A on the MultiChannel Configuration screen.
- The SVID, or Outer VLAN ID, is displayed in IBM Virtual Fabric Mode and IBM Unified Fabric Protocol Mode. This value is provided by the IBM switch and will appear when the protocol modes are configured on the switch and the adapter. If the protocol modes are not configured, a value of "N/A" is displayed.

2. From the configuration screen, you can perform the following tasks:
   - Configure PXE boot support – see "Configuring PXE Boot Support" on page 34 for instructions.
   - Configure PXE VLAN ID/Priority – see "Configuring the PXE VLAN ID and Priority" on page 35 for instructions.
   - Identify ports – see "Physically Identifying the Port" on page 36 for instructions.
   - Erase the port and adapter configuration – see "Erasing Ports and Controller Configuration" on page 36 for instructions.
   - Configure the LPVID for each channel – see "Configuring LPVID" on page 38 for instructions.

     Note: An LPVID is optional for IBM Virtual Fabric Mode, but it is required for every function when using Switch Independent Mode.

Note: When IBM Virtual Fabric Mode or Unified Fabric Protocol Mode is enabled, you must configure the minimum and maximum bandwidth settings on the switch.

PXE Boot Parameters Default Values

The default settings for the PXE Boot parameters are listed in the following table.

Table 2-2 PXE Boot Parameter Default Values

Parameter	Default Value	Valid Values
Advanced Mode	Enabled (OCe11100-series 2-port and 4-port controllers and the LPe16202/OCe15100 CFA) Disabled (OCe10100-series controllers)	Enabled Disabled
PXE Boot Support	The default for this parameter varies depending on the vendor configuration.	Enabled Disabled
SR-IOV	Disabled	Enabled Disabled
VLAN Support	Disabled	Enabled Disabled
VLAN ID	0	0–4094
VLAN Priority	0	0–7
Multichannel Mode	The default for this parameter varies depending on the vendor configuration.	For Emulex adapters: • Enabled • Disabled For IBM adapters: • IBM Virtual Fabric Mode • IBM Unified Fabric Protocol Mode • Switch Independent Mode • Disabled
Minimum Bandwidth	0%	Must have a total of 100% across all ports.
Maximum Bandwidth	0%	From the minimum bandwidth value up to 100% (inclusive).
LPVID	0	2–4094

3. Configuring PXE Boot for NIC on OCe14000-series Adapters

Note: This section applies only to OCe14000-series adapters. See chapter 2., "Configuring PXE Boot for NIC on LPe16202, OCe10100, and OCe11100-series Adapters," on page 25 for information specific to those adapters.

This section describes using and configuring PXE to boot computers using a network interface independent of available data storage devices (such as hard disks) or installed operating systems.

The PXE protocol is a combination of DHCP and TFTP with subtle modifications to both. DHCP locates the appropriate boot server or servers, and TFTP downloads the initial bootstrap program and additional files.

Network booting enables you to perform the following tasks:

- Boot diskless systems such as thin clients and dedicated systems.
- Deploy software and operating systems for your systems.
- Automate system maintenance, such as backups.
- Automate system checking, such as virus scanning.
- Ensure a system is secure.

Pre-OS

PXE can be used in a "pre-OS" environment. Pre-OS is the process of loading a small operating environment to perform a client management task before loading the final operating system from the local hard drive. For example, with a pre-OS you can scan the hard drive for viruses. This guarantees that the client is not infected before it starts. The WDS uses this to install operating systems on local disks or BFS disks.

PXE Boot Process

Once PXE Boot is enabled in the system UEFI/BIOS, the PXE client can boot up and start up the PXE boot ROM. This is the boot code physically located on the NIC adapter.

Note: To enable or disable PXE Boot, it must be enabled or disabled in the system UEFI/BIOS; see the documentation that accompanied the server for more information.

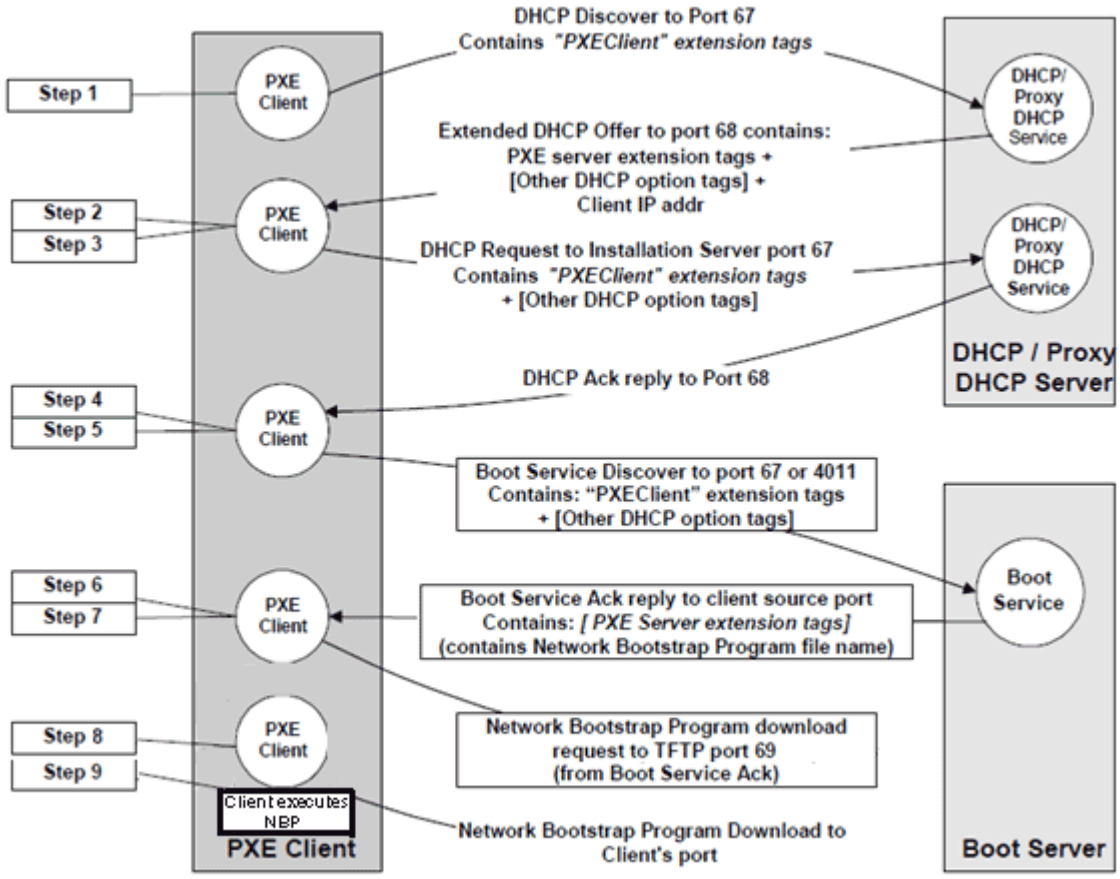

Figure 3-1 PXE Boot Process

Figure 3-1 shows the boot process.

1. The PXE boot ROM sends a DHCP request extended with PXE specific options (step 1 in the figure).
2. The DHCP responses contain the DHCP options (DHCPOFFERs) that include the NBP filename and boot server lists (steps 2 through 5).
3. The PXE client attempts to download the specified NBP over TFTP from one of the specified boot servers (steps 6 and 7).
4. The PXE client executes the downloaded NBP (steps 8 and 9).

Note: If any of these steps fail, the boot process typically continues using the next available device in the boot sequence, depending on the system configuration and boot order.

Remotely Installing with PXE for Windows Server 2008, 2008 R2, 2012, and 2012 R2

For remote installation with PXE, a network driver for the Emulex adapter must be part of the client's installation image on the server. The current versions of Windows Server 2008 and Windows Server 2008 R2 do not include network drivers for the Emulex adapter; however, Windows Server 2012 and 2012 R2 include the network driver for the Emulex adapter.

To add the image and installation using the driver with the Remote Installation Service Setup, select:

Start Menu > Programs > Administrative Tools Remote Installation Services Setup

(For more information, refer to *Microsoft Article ID Q246184 - How to Add Third-Party OEM Network Adapters to RIS Installations*.)

In addition to the network driver for the Emulex adapter, you must configure the following services to use PXE for remote installations:

- DHCP server
- Remote Installation Services
- Windows Deployment Services

Microsoft provides extensive documentation on deploying its operating systems for remote installations, and different setups may be required depending on your individual implementation. Microsoft provides step-by-step guides for its Windows Deployment Services for configuring your server, adding images, and installing an operating system. It also includes instructions for more advanced tasks like creating multicast transmissions, creating custom images, and performing an unattended installation.

For detailed information on deploying and managing remote installations on Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2, see the Microsoft website and visit Microsoft TechNet. Search on the bulleted terms above to access Microsoft's wide-ranging documentation on these subjects.

Remotely Installing with PXE for Linux and Citrix Servers

Linux allows for PXE installation over a network using the NFS, TFTP, or HTTP protocols. If the system to be installed contains an Emulex NIC or adapter with PXE Boot support, it can be configured to boot from files on another networked system rather than local media.

The Linux distributions provide extensive documentation on deploying and managing remote installations of the Linux operating system via PXE. See your appropriate distribution's documentation for instructions on how to deploy a PXE installation over your network.

For remote installation with PXE, a network driver for the Emulex adapter must be part of the client's installation image on the server. Your current Linux distribution may or may not include network drivers for Emulex adapters. If they do, the driver may need to be added to your operating system's installation image, or added during installation. See your appropriate distribution's documentation for instructions on how to add drivers during installation.

Using the PXESelect Utility

Note: If you are using Dell OCe14000-based adapters, refer to appendix H., "Configuring PXE Boot for NIC on Dell OCe14000-based Systems," on page 300 for information on using the PXESelect utility.

Navigating the PXESelect Utility

Use the following methods to navigate the PXESelect utility:

- Press the up or down arrows on your keyboard to move through and select menu options or configuration fields. When multiple adapters are listed, use the up/down arrows to scroll to the additional adapters.
- Press the left or right arrows on your keyboard to move through and select setting options.
- Press **<Enter>** to accept a selection, select a menu option, or to change a configuration default.
- Press **<F7>** to save the changes on the screen.
- Press **<Esc>** to return to the previous menu or page, cancel a selection or dialog box, or exit the utility.

Running the PXESelect Utility

To run the PXESelect utility, start or restart your computer. When prompted, hold down **<Ctrl>** and press **<P>**. If you are running the PXESelect utility with multiple controllers, all your controllers are displayed when you start the utility. For example:

```
Press <Ctrl><P> for PXESelect(TM)Utility

Controller#0 Port#0 Base 0xFCE60000 at Bus:05 Dev:00 Fun:00
Controller#0 Port#1 Base 0xFCEA0000 at Bus:05 Dev:00 Fun:01
Controller#1 Port#0 Base 0xFC920000 at Bus:01 Dev:00 Fun:00
Controller#1 Port#1 Base 0xFC960000 at Bus:01 Dev:00 Fun:01
- Initializing ...Done.
```

The PXE Configuration menu appears after the boot BIOS initializes to begin your PXE configuration.

Note: A UEFI-capable system typically does not display the prompt for running the PXESelect utility unless it is configured for legacy booting. See your system configuration manual for information on performing a legacy boot. All

configuration that can be performed in the PXESelect utility can instead be performed in the UEFI configuration utility. See chapter 11., "Configuring UEFI for Ethernet," on page 134 for more information.

Setting Up a PXE Bootable Network

After the PXE boot BIOS initializes, you can use the PXESelect utility to set up a PXE bootable network by configuring your controllers.

To configure controllers for PXE boot:

1. From the Controller List screen, use the up or down arrow keys to select the controller you want to configure and press **<Enter>**.

Figure 3-2 Controller List Screen

Note: The Controller List screen only appears if there are two or more adapters connected.

The Configure Controller screen appears.

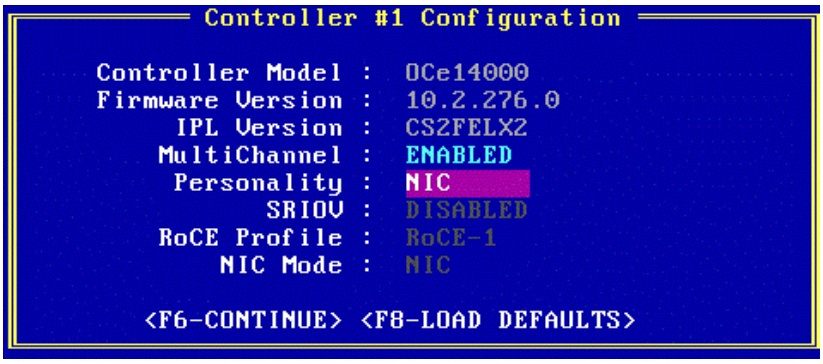

Figure 3-3 Configure Controller Screen

Depending on the adapter, one or more of the following items are displayed:

- Controller Name – displays the controller's name.
- Firmware Version – displays the current firmware version.
- IPL Version – displays the IPL version.
- MultiChannel – when multichannel is enabled, you can access up to 16 virtual network interfaces.
  - For additional information on multichannel, see "Configuring Multichannel" on page 56.

    Note: If you are using an IBM adapter, see "Configuring Multichannel for IBM Adapters" on page 62 for additional information.

Note: On HP systems, you can select either Disable or Flex-10 for the MultiChannel setting. When Flex-10 is selected, the settings are display only and cannot be configured.

Note: A reboot will occur when you exit the PXESelect utility if the multichannel mode has changed since the last boot.

- Personality – This option specifies a list of available protocols that can be configured on an adapter. For additional information on adapter personality, see "Configuring Personality" on page 49.

  Note: Changing the Personality setting requires a reboot before the change will take effect. A reboot will occur when you exit the PXESelect utility if the Personality setting has changed since the last boot.

- SRIOV – if your system BIOS supports SR-IOV, you can enable it when multichannel is disabled or it is not supported. For more information on SR-IOV configuration, see "Configuring SR-IOV" on page 50.
- RoCE Profile – This setting is only available when the Personality is set to "NIC+RoCE". For more information, see "Configuring Personality" on page 49.
- NIC Mode – This setting is only available when SR-IOV is enabled, Personality is set to "NIC", and a two-port OCe14000-series adapter is in use. For more information, see "Configuring Personality" on page 49.

2. Once you have set the options in the Configure Controller screen, press **<F7>** to save the current settings.
3. Press **<F6>** to proceed.

   Note: If you want to erase the current configuration, press **<F8>**. See "Erasing Ports and Controller Configuration" on page 55 for more information.

   The Port Selection Menu appears.

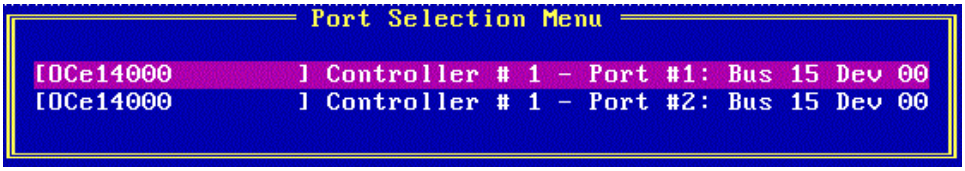

Figure 3-4 Port Selection Menu

Note: The Port Selection Menu only appears if there are two or more ports connected.

4. Select the port you want to configure and press **<Enter>**. The Port Menu appears.

   Depending on your installed adapter and the MultiChannel setting, proceed to the following sections:

   - If multichannel is disabled, or it is not supported, refer to "Configuring Ports When Multichannel is Disabled or Not Supported" on page 49 for additional configuration information.

- If multichannel is enabled, refer to "Configuring Multichannel" on page 56 for additional configuration information.
- If multichannel is enabled and you are using IBM adapters, refer to "Configuring Multichannel for IBM Adapters" on page 62 for additional configuration information.

Configuring Ports When Multichannel is Disabled or Not Supported

Note: If your adapter has multichannel enabled, refer to "Configuring Multichannel" on page 56. If you are using an IBM adapter, refer to "Configuring Multichannel for IBM Adapters" on page 62.

Configuring Personality

The "personality" reflects the protocol, or protocols, of the adapter. This option specifies a list of available protocols that can be configured on an adapter. Depending on the personalities for which the adapter is licensed one or more of the following selections may appear:

- NIC – implies that all the enabled functions provide NIC functionality
- iSCSI or FCoE – these personalities are enabled on one function per adapter port and include NIC functionality on the other enabled functions. There can be only one of each storage protocol on each port.
- NIC+RoCE – implies that all the enabled functions provide RoCE functionality. When NIC+RoCE is enabled, the RoCE Profile selection is available.

  Note: When SR-IOV is enabled, the NIC+RoCE personality setting is unavailable.

  Note: RoCE is supported on Windows only.

The menu only displays the available personalities, including both free and licensed personalities.

Note: There cannot be two iSCSI functions and two FCoE functions on a single port.

To select the personality of the adapter:

1. From the Configure Controller screen, use the up or down arrow keys to select **Personality**.

Use the left or right arrow keys to select the desired personality.

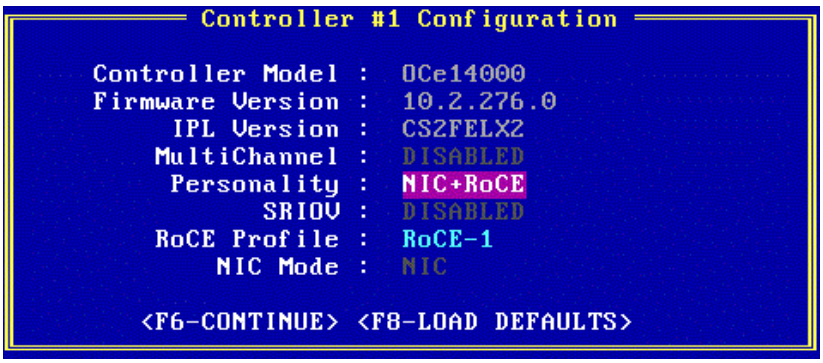

Figure 3-5 Configure Controller Screen – Personality Selection

2. Press **<F7>** to save.

Note: Changing the Personality setting requires a reboot before the change will take effect. A reboot will occur when you exit the PXESelect utility if the Personality setting has changed since the last boot.

Configuring the RoCE Profile

Note: The RoCE Profile setting is only available when the NIC+RoCE personality is selected.

The RoCE profile allows you to select the appropriate profile for your particular system setup. The RoCE profile choices include:

- RoCE-1 – For the RoCE-1 profile, check the Implementer's Lab on the Emulex website for any updated information on use cases for the RoCE-1 profile.
- RoCE-2 – Choose the RoCE-2 profile for SMB Direct on Windows Server 2012 and Windows Server 2012 R2.

To select a RoCE Profile:

1. From the Configure Controller screen, ensure that the NIC+RoCE personality is selected.
2. Use the up or down arrow keys to select **RoCE Profile**.
3. Use the left or right arrow keys to select the desired profile and press **<Enter>**.
4. Press **<F7>** to save.

Configuring SR-IOV

If your system BIOS supports SR-IOV, you can enable it on the adapter. SR-IOV support can only be enabled when multichannel is disabled or not supported.

Note: When SR-IOV is enabled, the NIC+RoCE personality setting is unavailable.

To configure SR-IOV:

1. From the Configure Controller screen, use the up or down arrow keys to select **SRIOV**.

2. Use the left or right arrow keys to enable or disable SRIOV.
3. Press **<F7>** to save.

For more information on SR-IOV configuration, see the appropriate Emulex driver manual.

Configuring NIC Mode

Note: This setting is only available when SR-IOV is enabled, Personality is set to "NIC", and a two-port OCe14000-series adapter is in use.

This setting allows you to control the VF count on a two-port OCe14000-series adapter. The choices include:

- NIC – the VF count is restricted to 31 VFs per port and QoS is supported for those VFs.
- NIC-ETS Disabled – the VF count is set to 63 VFs per port but QoS is not supported for those VFs.

To select the NIC Mode:

1. From the Configure Controller screen (Figure 3-5), ensure that the NIC personality is selected and SR-IOV is enabled.
2. Use the up or down arrow keys to select **NIC Mode**.
3. Use the left or right arrow keys to select the desired setting and press **<Enter>**.
4. Press **<F7>** to save.

Loading Default Settings

If you want to erase the current configuration, from the Configure Controller screen press **<F8>**.

See "Erasing Ports and Controller Configuration" on page 55 for more information.

Selecting a Port

Once you have set the options in the Configure Controller screen, ensure that you have saved your changes. To save the current settings, press **<F7>**.

To proceed to the Port Selection menu:

1. From the Configure Controller screen, press **<F6>**. The Port Selection Menu appears.

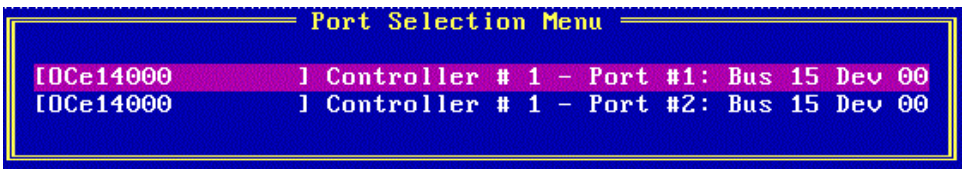

Figure 3-6 Port Selection Menu

Note: The Port Selection Menu only appears if there are two or more ports connected.

2. Select the port you want to configure and press **<Enter>**. The Port Menu appears.

Figure 3-7 Port Menu Screen

The Port Menu screen enables you to perform the following tasks:

- View NIC configuration information – see "Viewing NIC Configuration Information" on page 52 for additional information.
- Configure boot options – see "Configuring Boot Options" on page 53 for instructions.
- Configure port options – see "Configuring Port Options" on page 54 for instructions.

Viewing NIC Configuration Information

To view the NIC configuration information:

1. From the Port Menu screen, use the up or down arrow keys to select **1. NIC Configuration** and press **<Enter>**. Depending on the currently selected Personality setting, one of the following screens will appear.
   - If the Personality setting is set to iSCSI or FCoE, the Channel(s) List screen appears.

Figure 3-8 Channel(s) List Screen

   Select a channel using the up or down arrow keys and press **<Enter>**. The Configure Channel screen appears.

- If the Personality setting is set to NIC or NIC+RoCE, the Configure Channel screen appears.

Figure 3-9 Configure Channel Screen

2. From the Configure Channel screen, you can view the following information:
   - Function number
   - Protocol
   - Minimum BW (Min BW)
   - Maximum BW (Max BW)
   - Permanent and virtual MAC addresses
   - Logical link status
   - Assigned LPVID
   - SRIOV status

Configuring Boot Options

To view the Boot Configuration screen:

1. From the Port Menu (Figure 3-7), select **2. Boot Configuration** and press **<Enter>**. The Boot Configuration screen appears.

Figure 3-10 Boot Configuration Screen

From the Boot Configuration screen, you can configure PXE boot support.

Configuring PXE Boot Support

To configure PXE boot support:

1. On the Boot Configuration screen, use the left or right arrow keys to enable or disable the PXE Boot setting.
2. Press **<F7>** to save.

Note: During system startup when PXE boot is enabled, PXE contacts the DHCP server for an IP address to boot from the network.

Configuring Port Options

To view the Port Configuration screen:

1. From the Port Menu (Figure 3-7), select **3. Port Configuration** and press **<Enter>**. The Port Configuration screen appears.

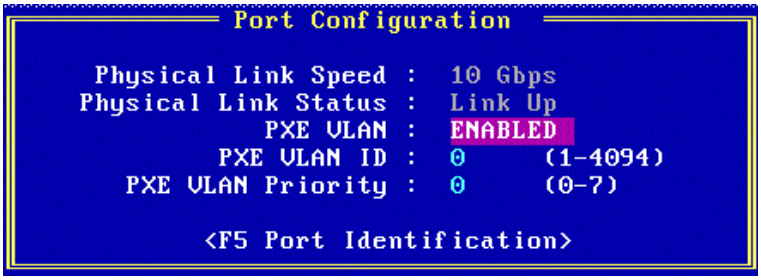

Figure 3-11 Port Configuration Screen

2. From the Port Configuration screen, you can perform the following tasks:
   - View the physical link speed and link status.
   - Configure PXE VLAN, including the PXE VLAN ID and priority – see "Configuring PXE VLAN" on page 54 for instructions.
   - Identify the port – see "Physically Identifying the Port" on page 55 for instructions.

Configuring PXE VLAN

To enable PXE VLAN:

1. On the Port Configuration screen, use the up or down arrow keys to highlight the current PXE VLAN setting.
2. Use the left or right arrow keys to enable the PXE VLAN setting.
3. Press **<F7>** to save.

To configure a PXE VLAN ID:

1. On the Port Configuration screen, use the up or down arrow keys to highlight the current PXE VLAN ID setting.
2. Use the left or right arrow keys to enter a number from 1-4094.
3. Press **<F7>** to save.

To set the priority level:

1. On the Port Configuration screen, use the up or down arrow keys to highlight the current PXE VLAN Priority setting.
2. Use the left or right arrow keys to enter a number from 0-7.

   This unique value assigns a priority to outbound packets containing a specified VLAN ID. Valid values range from 0-7, with 0 being the highest priority level.
3. Press **<F7>** to save.

After you exit the PXESelect utility, the system will reboot for the configuration to take effect.

Physically Identifying the Port

To physically determine which port you are configuring by causing the link and activity LEDs of that port to blink:

1. On the Port Configuration screen, press **<F5>**.
2. The LEDs on your controller begin blinking. The selected port's LED status indicators blink on your controller for approximately 15 seconds.

Note: Not all controllers have LEDs that are visible externally. If you are using an add-in card in a blade server environment, the port identification or beaconing capability does not work.

Erasing Ports and Controller Configuration

Note: When this setting is selected, all previous configuration settings are returned to their factory default settings except for the current personality selection. Emulex recommends performing this action to provide a clean environment for new configuration settings to take effect.

To erase the ports and controller configuration:

1. On the Configure Controller screen (Figure 3-3), press **<F8>** to restore the factory default settings. A warning appears asking if you want to erase the current configuration for all ports of the controller.
2. Press **<Y>** to delete the configuration. You will receive another warning asking you to confirm the permanent removal of the controller configuration.
3. Press **<Y>** to delete the configuration.

To exit the PXESelect utility after erasing the ports and controller configuration:

1. Follow the instructions on the bottom of the individual menu screens until you are prompted to exit.
2. Press **<Y>** to exit. Depending on the settings that were changed, a reboot may be necessary.

   Note: For older systems, depending on the memory allocation method supported, the PXESelect utility automatically reboots even when there are no changes made to the system.

Configuring Multichannel

Note: If your adapter has multichannel enabled and also supports IBM Virtual Fabric Mode or IBM Unified Fabric Protocol Mode, refer to "Configuring Multichannel for IBM Adapters" on page 62 for additional information. If multichannel is disabled or not supported on the adapter, refer to "Configuring Ports When Multichannel is Disabled or Not Supported" on page 49.

Enabling Multichannel

Multichannel, or UMC, provides the ability to configure multiple physical functions or I/O channels for each physical adapter port. For additional information on multichannel support, see the *Emulex Universal Multichannel Reference Guide*.

Notes:

- When multichannel is enabled, you must configure the multichannel settings (minimum and maximum bandwidths) for iSCSI and FCoE storage functions in the NIC BIOS before they can be configured further from their respective utilities (iSCSI or FCoE BIOS). Otherwise, the Logical Link for that function will still show as down, and you will not be able to log into targets or find LUNs behind those targets.
- Multichannel functionality is only supported on OneConnect adapters running in 10 Gb or 40 Gb mode. The 1 Gb mode does not support multichannel.
- SR-IOV is not available when multichannel is enabled.

To enable multichannel:

1. From the Configure Controller screen, use the up or down arrow keys to select **MultiChannel**.
2. Use the left or right arrow keys to enable multichannel.

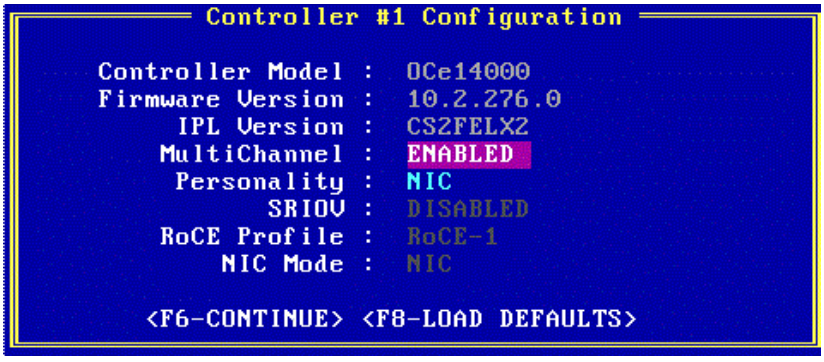

Figure 3-12 Configure Controller Screen – MultiChannel Enabled

3. Press **<F6>** to proceed.

ARI Support

The OCe14000-series adapters support ARI, which provides the ability to configure additional PCI functions or I/O channels for each physical adapter port when multichannel is enabled.

You can configure up to 16 functions on a one-port OCe14400-series adapter, up to eight functions per port on a one or two-port OCe14100-series adapter, and up to four functions per port on a four-port OCe14100-series adapter.

The maximum number of functions allowed on an adapter is controlled by the adapter's IPL file and the system's support for ARI.

The following requirements must be met in order to support more than eight functions on an adapter.

- The system hardware (the motherboard and BIOS) must support ARI.
- ARI must be enabled in the system BIOS.
- The host operating system must support ARI:
  - Windows Server 2012 and newer versions
  - RHEL 6.4 and newer versions
  - SLES 11 SP2 and newer versions
  - ESXi 5.0 and newer versions
- The application management tools, including the OneCommand Manager application must support ARI.
- ARI must be enabled in the firmware using the OneCommand Manager application.

If these conditions are not met, you may be able to configure more than eight functions, but only up to eight functions will be running and discovered after a reboot.

Configuring Personality

The "personality" reflects the protocol, or protocols, of the adapter. This option specifies a list of available protocols that can be configured on an adapter. Depending on the personalities for which the adapter is licensed, one or more of the following selections appears:

- NIC – implies that all the enabled functions provide NIC functionality
- iSCSI or FCoE – these personalities are enabled on one function per adapter port and include NIC functionality on the other enabled functions. There can be only one of each storage protocol on each port.

  Note: There cannot be two iSCSI functions and two FCoE functions on a single port.

- Custom – for information about custom personalities, see "Configuring the Custom Personality Selection" on page 58.

The menu only displays the available personalities, including both free and licensed personalities.

To select the personality of the adapter:

1. From the Configure Controller screen (Figure 3-12), use the up or down arrow keys to select **Personality**.
2. Use the left or right arrow keys to select the desired personality.
3. Press **<F7>** to save.

   Note: Changing the Personality setting requires a reboot before the change will take effect. A reboot will occur when you exit the PXESelect utility if the Personality setting has changed since the last boot.

Configuring the Custom Personality Selection

The Custom personality allows you to select the protocol type for each function. The first function on the port must always be assigned the NIC personality. iSCSI and FCoE personalities may only be enabled on one function per adapter port.

Note: There cannot be two iSCSI functions and two FCoE functions on a single port.

To select the Custom personality:

1. From the Configure Controller screen, use the up or down arrow keys to select **Personality**.
2. Use the left or right arrow keys to select the **Custom** personality and press **<Enter>**. A pop-up menu is displayed.
3. Select the desired personality for the appropriate function using the arrow keys.

   As mentioned previously for the Custom personality, iSCSI and FCoE personalities may only be enabled on one function per adapter port.
4. Press **<F7>** to save.

   Note: Changing the Personality setting requires a reboot before the change will take effect. A reboot will occur when you exit the PXESelect utility if the Personality setting has changed since the last boot.

Loading Default Settings

If you want to erase the current configuration, from the Configure Controller screen, press **<F8>**.

See “Erasing Ports and Controller Configuration” on page 55 for more information.

Selecting a Port

Once you have set the options in the Configure Controller screen, ensure that you have saved your changes. To save the current settings, press **<F7>**.

To proceed to the Port Selection menu:

1. From the Configure Controller screen, press **<F6>**. The Port Selection Menu appears.

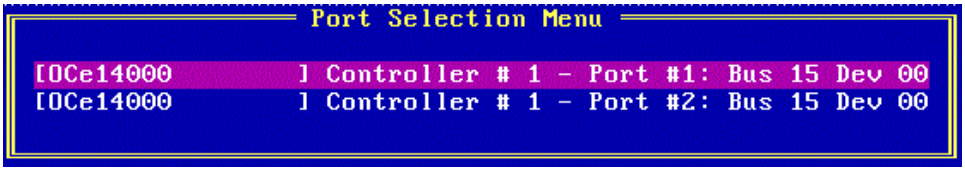

Figure 3-13 Port Selection Menu

Note: The Port Selection Menu only appears if there are two or more ports connected.

2. Use the up or down arrow keys to select the port you want to configure and press **<Enter>**. The Port Menu appears.

Figure 3-14 Port Menu Screen

The Port Menu screen enables you to perform the following tasks:

- Configure multichannel options – see "Configuring Multichannel Options" on page 60 for instructions.
- Configure boot options – see "Configuring Boot Options" on page 53 for instructions.
- Configure port options – see "Configuring Port Options" on page 54 for instructions.

Configuring Multichannel Options

To configure the multichannel options:

1. From the Port Menu screen, use the up or down arrow keys to select **1. MultiChannel Configuration** and press **<Enter>**. The Channel(s) List screen appears.

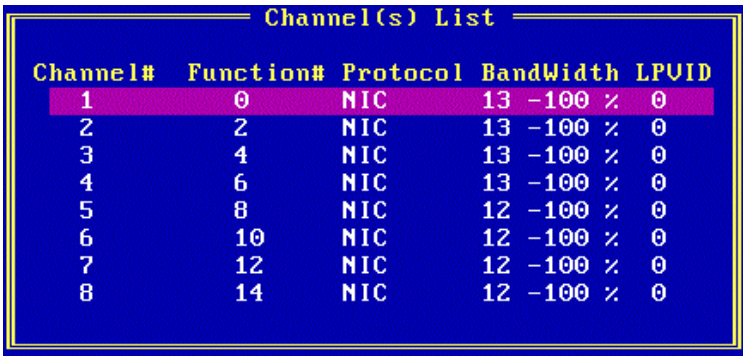
Channel(s) List
Channel# Function# Protocol BandWidth LPVID
1 0 NIC 13 -100 % 0
2 2 NIC 13 -100 % 0
3 4 NIC 13 -100 % 0
4 6 NIC 13 -100 % 0
5 8 NIC 12 -100 % 0
6 10 NIC 12 -100 % 0
7 12 NIC 12 -100 % 0
8 14 NIC 12 -100 % 0

Figure 3-15 Channels List Screen

2. Select a channel using the up or down arrow keys and press **<Enter>**. The Configure Channel screen appears.

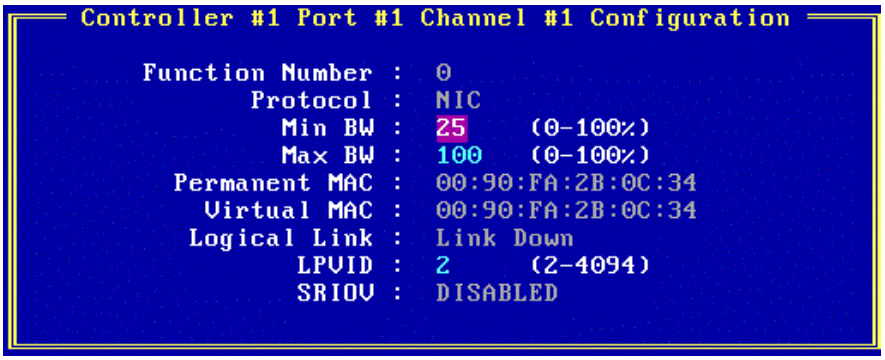
Controller #1 Port #1 Channel #1 Configuration
Function Number : 0
Protocol : NIC
Min BW : 25 (0-100%)
Max BW : 100 (0-100%)
Permanent MAC : 00:90:FA:2B:0C:34
Virtual MAC : 00:90:FA:2B:0C:34
Logical Link : Link Down
LPVID : 2 (2-4094)
SRIOV : DISABLED

Figure 3-16 Configure Channel Screen

3. From the Configure Channel screen, you can perform the following tasks:
   - View the function number.
   - Select the protocol for each function, except for PF #0 and PF #1. See "Configuring Personality" on page 57 for instructions.
   - Configure the minimum and maximum bandwidth for each channel. See "Configuring Minimum and Maximum Bandwidth" on page 61 for instructions.
   - View the permanent and virtual MAC addresses.
   - View the logical link status.

     Note: Logical Link Status is displayed as "N/A" for storage functions.

   - Configure the LPVID for each channel. For more information, see "Configuring LPVID" on page 61.
   - View the SR-IOV status.

Note: SR-IOV is automatically disabled when multichannel is enabled.

Note: Your adapter or system may not support all multichannel options.

Configuring Minimum and Maximum Bandwidth

To configure bandwidth:

1. On the Configure Channel screen, use the use the up or down arrow keys to select **Min BW** or **Max BW**.
2. Use the left or right arrow keys to select the desired bandwidth value.
   - The Minimum Bandwidth value is the least amount of bandwidth that the function can provide. It is represented as a percentage. The Minimum Bandwidth value must be less than or equal to the Maximum Bandwidth value. The total of the Minimum Bandwidth values for all enabled functions on that port must be equal to 100.

     Note: A Minimum Bandwidth value of 0 is a valid value. When all of the partitions' Minimum Bandwidth values are zero, the bandwidth is distributed equally among the current active partitions. If a specific partition's Minimum Bandwidth and Maximum Bandwidth values are 0, that partition's logical link will be brought down.

   - The Maximum Bandwidth value is the greatest amount of bandwidth that the function can provide. It is represented as a percentage.
3. Press **<F7>** to save.

Configuring LPVID

The LPVID is used to enforce a VLAN ID on all traffic originating from an IP address, channel, or PCI function. If the operating system for that PCI function has set up a VLAN ID, then the operating system-configured VLAN ID takes precedence over the LPVID for transmit packets while the operating system-configured VLAN ID and LPVID-tagged packets will both be received. If the operating system has not set up any VLAN IDs, then the LPVID is used for tagging.

Note: LPVID and user-configured VLAN IDs from the operating system must be different.

Note: LPVIDs must be configured on the switch port.

Each LPVID must be unique and is relevant for NIC traffic only. The LPVID is not supported for storage functions. For iSCSI storage functions, you must configure a VLAN ID through iSCSISelect or through the host. For additional information, see "Configuring VLAN ID and VLAN Priority" on page 113.

During PXE boot when the UNDI Driver (BIOS) is functional, the PXE VLAN is used. However, once the NIC driver is operational the LPVID is used.

Note: If no PXE VLAN is configured, the LPVID is used.

For example:

```
PXE Install OS
PXE Server configured with VLAN 5
PXE VLAN=5
LPVID for function 0=5
```

To configure LPVID:

1. On the Configure Channel screen, use the use the up or down arrow keys to select **LPVID**.
2. Use the left or right arrow keys to select the desired LPVID value. The LPVID range is 2-4094. A value of 0 disables the LPVID.
3. Press **<F7>** to save.

Configuring Multichannel for IBM Adapters

Note: This section only pertains to certain Emulex OneConnect adapters that support IBM Virtual Fabric multichannel or Unified Fabric Protocol.

When you want to enable multichannel on IBM adapters, you must select a Multichannel Mode.

To select the Multichannel Mode:

1. From the Controller Configuration screen, use the up or down arrow keys to select the Multichannel Mode setting.

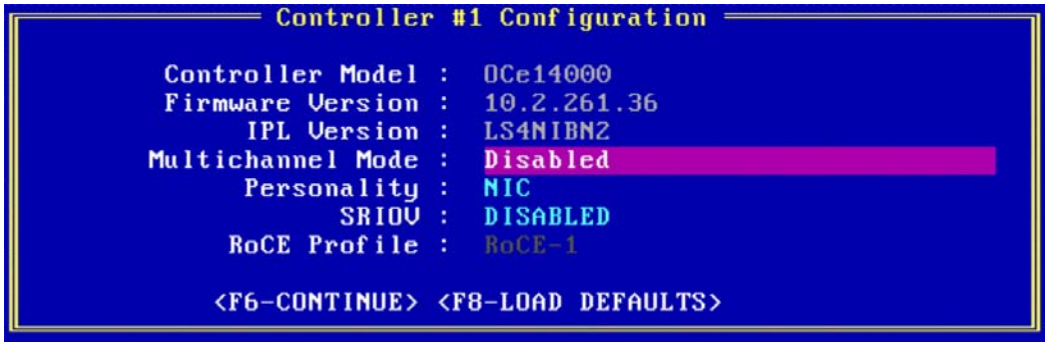

Figure 3-17 Controller Configuration Screen - IBM Adapters

2. Use the left or right arrow keys to select one of the following settings and press **<Enter>**:
   - Switch Independent Mode
   - IBM Virtual Fabric Mode
   - IBM Unified Fabric Protocol Mode
   - Disabled

   Note: For more information on the available Multichannel Modes, see "Multichannel Modes".

3. Press **<F6>** to proceed.

With the Multichannel Mode selected, you can now configure multichannel support. See "Multichannel Configuration" for more information.

Multichannel Modes

Note: The following modes are only available on IBM adapters and systems that support IBM Virtual Fabric and Unified Fabric Protocol modes.

An IBM Virtual Fabric-enabled switch provides the ability to configure an LPVID for a virtual channel or I/O channel on an adapter port. If multichannel is supported on your system, the PXESelect utility enables you to select one of the following modes:

- IBM Virtual Fabric Mode – select this mode when a OneConnect adapter is attached to an IBM Virtual Fabric-enabled switch.
- IBM Unified Fabric Protocol Mode – select this mode when a OneConnect adapter is attached to an IBM UFP-enabled switch.

  Note: Some IBM switches support both UFP and IBM Virtual Fabric Mode.

- Switch Independent Mode – select this mode if you are using a switch other than an IBM Virtual Fabric or UFP-enabled switch. When this mode is enabled, refer to "Configuring Multichannel" on page 56 for information on configuring multichannel.

Note: Multichannel functionality is only supported on OneConnect adapters running in 10 Gb mode. The 1 Gb mode does not support multichannel.

Multichannel Configuration

Multichannel provides the ability to configure multiple PCI functions or I/O channels for each physical adapter port.

Note: Setting up IBM Virtual Fabric or UFP multichannel depends on cooperation with adjacent switches.

Note: Refer to "Configuring Multichannel" on page 56 for information on configuring multichannel when Switch Independent mode is enabled.

To view the configuration screen:

1. From Port Selection Menu (Figure 3-13), select the port you want to configure and press **<Enter>**. The configuration screen appears.

   When configuring multichannel, the configuration options will depend on the Multichannel Mode that has been selected.

Note: For illustration purposes, the screen displays in this section are for a system with the IBM Virtual Fabric Mode multichannel mode selected.

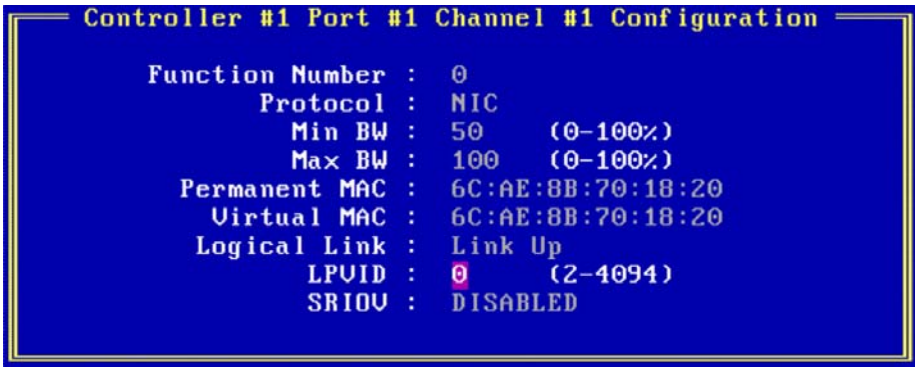
Controller #1 Port #1 Channel #1 Configuration
Function Number : 0
Protocol : NIC
Min BW : 50 (0-100%)
Max BW : 100 (0-100%)
Permanent MAC : 6C:AE:8B:70:18:20
Virtual MAC : 6C:AE:8B:70:18:20
Logical Link : Link Up
LPVID : 0 (2-4094)
SRIOV : DISABLED

Figure 3-18 IBM Virtual Fabric Mode MultiChannel Configuration Screen

Note: If your system does not support some of the multichannel options, those unavailable options are disabled on the MultiChannel Configuration screen.

2. From the MultiChannel Configuration screen, you can perform the following tasks:
   - View the function number.
   - Select the protocol for each function, except for PF #0 and PF #1. See "Configuring Personality" on page 57 for instructions.

     Note: The Custom personality is not supported on IBM adapters and systems.

   - Configure the minimum and maximum bandwidth for each channel. See "Configuring Minimum and Maximum Bandwidth" on page 61 for instructions.

     Note: When Switch Independent Mode is enabled, you must configure the minimum and maximum bandwidth settings on the switch.

   - View the permanent and virtual MAC addresses.
   - View the logical link status.

     Note: Logical Link Status is displayed as "N/A" for storage functions.

   - Configure the LPVID for each channel. For more information, see "Configuring LPVID" on page 61.

     Note: An LPVID is optional for IBM Virtual Fabric Mode, but it is required for every function when using Switch Independent Mode.

   - View the SR-IOV status.

     Note: SR-IOV is automatically disabled when multichannel is enabled.

PXE Boot Parameters Default Values

The default settings for the PXE Boot parameters are listed in the following table.

Table 3-1 PXE Boot Parameter Default Values

Parameter	Default Value	Valid Values
Multichannel	The default for this parameter varies depending on the vendor configuration.	For Emulex adapters: • Enabled • Disabled For IBM adapters: • IBM Virtual Fabric Mode • IBM Unified Fabric Protocol Mode • Switch Independent Mode • Disabled
Personality	The default for this parameter varies depending on the vendor configuration.	When multichannel is enabled: • NIC • iSCSI • FCoE • Custom When multichannel and SR-IOV are disabled: • NIC • iSCSI • FCoE • NIC+RoCE **Note:** RoCE is supported on Windows only. When multichannel is disabled and SR-IOV is enabled: • NIC • iSCSI • FCoE
SR-IOV	Disabled	Enabled Disabled
RoCE Profile **Note:** This setting is only available when the NIC+RoCE personality is selected.	RoCE-1	RoCE-1 RoCE-2
Minimum Bandwidth	0%	Must have a total of 100% across all ports.
Maximum Bandwidth	0%	From the minimum bandwidth value up to 100% (inclusive).
LPVID	0	2–4094

Table 3-1 PXE Boot Parameter Default Values (Continued)

Parameter	Default Value	Valid Values
PXE Boot Support	The default for this parameter varies depending on the vendor configuration.	Enabled Disabled
PXE VLAN	Disabled	Enabled Disabled
PXE VLAN ID	0	0–4094
PXE VLAN Priority	0	0–7

4. Configuring Boot from SAN for the FCoE Protocol

When booting from SAN, the storage device is typically identified by its WWPN and a LUN. By extending the server system BIOS, boot from SAN capability is provided by the boot BIOS contained on an Emulex adapter in the server. When properly configured, the adapter then permanently directs the server to boot from a logical unit (disk) on the SAN as if it were a local disk.

Note: Not all procedures are required. Emulex adapters usually ship from the factory with the latest version of boot code installed and enabled, so you do not need to install or enable boot code in those cases. However, if boot code is not enabled, you must enable it. You may want to update the boot code if a more current version is available on the Emulex website at http://www.emulex.com.

This section describes how to set up a system to boot from SAN. This specific procedure to follow is determined by the system architecture and the operating system.

Windows Server 2008, Windows Server 2012, and Windows Server 2012 R2

Configuring Boot from SAN on Windows (x64)

To configure boot from SAN:

1. If necessary, update the boot code on the adapter. See chapter 7., “Updating and Enabling Boot Code,” on page 104 for more information.
2. If necessary, enable the boot code on the adapter. See chapter 7., “Updating and Enabling Boot Code,” on page 104 for more information.
3. Enable the adapter to boot from SAN. See “Enabling an Adapter to Boot from SAN” on page 88 for more information.
4. Configure boot devices. See “Configuring Boot Devices” on page 90 for more information.
5. If desired, configure the boot options on the adapter. See “Configuring Advanced Adapter Parameters” on page 93 for more information.
6. Install the operating system on a boot disk.

   For additional information, see “Installing Windows Server 2008, 2008 R2, 2012, or 2012 R2 on a Boot Disk (x64)” on page 70.

Configuring Boot from SAN on Windows (UEFI)

To configure boot from SAN:

1. If necessary, update the boot code on the adapter. See chapter 7., "Updating and Enabling Boot Code," on page 104 for more information.
2. If necessary, enable the boot code on the adapter. See "Enabling an Adapter to Boot from SAN" on page 88 for more information.
3. Configure boot devices. See "Configuring Boot Devices" on page 90 for more information.
4. If desired, configure the boot options on the adapter. See "Configuring Advanced Adapter Parameters" on page 93 for more information.
5. Install the operating system on a boot disk:
   - For a new installation of a UEFI-aware operating system on a UEFI-based x64 server, see "Installing a New Windows UEFI-aware Operating System on a UEFI-based x64 Server" on page 68.
   - For Windows Server 2008, 2012, or 2012 R2, see "Installing Windows Server 2008, 2008 R2, 2012, or 2012 R2 on a Boot Disk (x64)" on page 70.

Installing a New Windows UEFI-aware Operating System on a UEFI-based x64 Server

This installation procedure assumes LUNs are created in the SAN storage device and zoned appropriately to the host adapter's WWN.

To install a new Windows Server UEFI-aware operating system:

1. From the server system UEFI setup, ensure that CD/DVD is the first device in the Boot Order list.
2. Enable the adapter BIOS setting to allow SAN boot in the Emulex UEFI configuration utility.
3. Configure the boot target and LUN in Emulex UEFI configuration utility to select the desired target.
4. Boot the host server with the Windows Server 2008, 2008 R2, 2012, or 2012 R2 DVD inserted. Follow the on-screen prompts to install the appropriate version of Windows Server.
5. The Windows installation exposes all available/visible LUNs as disks and partitions numbered 0 to N, where N is the highest number available. These numbers typically are the LUN numbers assigned by the array.
6. Select the disk on which you want to install the operating system.
7. Follow system prompts in the Windows installation.

   Note: The operating system image is installed with the GPT disk partition. See "GUID Partition Table" on page 69 for a brief description of GPT disk partitions.

8. After the installation is complete, a boot option variable called Windows Boot Manager is populated with a media device path pointing to the Windows boot

loader utility. Windows Boot Manager can be found in the Start Options menu of the Host Server UEFI.

9. The Windows Boot Manager option is inserted as the first boot option in the boot order list of the Host Server UEFI. The CD/DVD boot is the second device in the boot order list.
10. Upon reboot, the system boots from the LUN set up on the SAN.

Directing a UEFI-based Server to a Windows Server 2008, 2008 R2, 2012, or 2012 R2 Operating System Image (Installed as UEFI-aware) Already Installed on the SAN

This installation procedure assumes a LUN exists in the SAN storage device, is zoned appropriately to the host adapter's WWN, and a UEFI-aware operating system resides on the target LUN.

To direct a UEFI-based server to a Windows Server operating system image:

1. Enable network boot in the Emulex UEFI configuration utility.
2. Configure the boot target and LUN in the Emulex UEFI configuration utility to point to your desired target.
3. Select **Boot Manager** from the System UEFI configuration manager.
4. Select **Add Boot Option**.
5. Identify the desired target in the list, and continue down the explorer path until you locate the bootmgfw.efi file. This file is the boot loader utility for your Windows Server 2008, 2008 R2, 2012, or 2012 R2 UEFI-aware operating system installation.
6. Input a boot device description (for example, Win2K8_UEFI_SAN) and optional data (if desired) for this device and select **Commit Changes**.
7. From the Windows Boot Manager, select **Change Boot Order**.
8. Move your previous input description name (Win2K8_UEFI_SAN) to the desired position in the boot order.
9. Select **Commit Changes**. The Start Options list now reflects the boot order changes.

   Upon reboot, the server is able to boot from this target LUN on the SAN.

GUID Partition Table

The GPT was introduced as part of the EFI initiative. GPT provides a more flexible mechanism for partitioning disks than the older MBR partitioning scheme that has been common to PCs. MBR supports four primary partitions per hard drive and a maximum partition size of 2 TB. If the disk is larger than 2 TB (the maximum partition size in a legacy MBR), the size of this partition is marked as 2 TB and the rest of the disk is ignored.

The GPT disk itself can support a volume up to 2^{64} blocks in length (for 512-byte blocks, this is 9.44 ZB). The GPT disk can also theoretically support unlimited partitions.

Note: By default, Microsoft Windows Server 2008, 2008 R2, 2012, and 2012 R2 installs with a GPT-formatted disk on an UEFI-aware server.

For more information on the GUID partition table, see the Microsoft website and search for the terms *Windows* and *GPT FAQ*.

Installing Windows Server 2008, 2008 R2, 2012, or 2012 R2 on a Boot Disk (x64)

This procedure installs Windows Server 2008, 2008 R2, 2012, or 2012 R2 onto an unformatted disk drive and configures the system to boot from the SAN disk drive.

Note: The computer's system BIOS may require that another controller take precedence over the Emulex adapter during boot. If this occurs, you must disconnect or disable the other adapter. This allows you to configure and build your operating system on the drive connected to the Emulex adapter.

To install Windows Server on a boot disk:

1. Install the Emulex driver for Windows as described in the *Emulex Drivers for Windows User Manual*.
2. In Windows Explorer, navigate to the folder you specified during driver installation.
3. In the \AutoPilot Installer\Drivers*drivername* folder, open the folder that corresponds to your computer type, such as x64. *drivername* is the type of driver you downloaded.
4. Copy all the files in this folder onto a formatted floppy disk or a USB device.
5. Boot the target system with the Windows Server 2008, 2008 R2, 2012, or 2012 R2 setup media. The Install Windows splash screen is displayed.
6. Verify and if necessary change the language, time and date and keyboard values. Click **Next**. Another splash screen is displayed.
7. Click **Install Now**. The Where do you want to install Windows? screen is displayed.
8. Click **Load Driver**. Browse to the floppy disk or USB device specified in step 8 where the driver is located to load the driver for the appropriate operating system. Once selected, the correct driver location and driver are displayed under the Select driver to be installed screen.
9. Select **Next**. After the driver is loaded, the Where do you want to install Windows? screen is displayed.
10. Select the same drive you configured as the boot device. See "Configuring Boot Devices" on page 90.

Linux, Citrix, and VMware

Configuring Boot from SAN on Linux, Citrix, or VMware (x86 and x64)

To configure boot from SAN:

1. If necessary, update the boot code on the adapter. See chapter 7., "Updating and Enabling Boot Code," on page 104 for more information.
2. If necessary, enable the boot code on the adapter. See chapter 7., "Updating and Enabling Boot Code," on page 104 for more information.
3. Enable the adapter to boot from SAN. See "Enabling an Adapter to Boot from SAN" on page 88 for more information.
4. If necessary, enable spinup delay. See "Enabling or Disabling the Spinup Delay" on page 97 for more information.
5. Configure boot devices. See "Configuring Boot Devices" on page 90 for more information.
6. If desired, configure the boot options on the adapter. See "Configuring Advanced Adapter Parameters" on page 93 for more information.
7. Use the driver on the operating system distribution disk to boot the system. If necessary, you can update the driver to the latest version.

Configuring Boot from SAN on Linux (UEFI)

To configure boot from SAN:

1. If necessary, update the latest boot code on the adapter. See chapter 7., "Updating and Enabling Boot Code," on page 104 for more information.
2. If necessary, enable the boot code on the adapter. See chapter 7., "Updating and Enabling Boot Code," on page 104 for more information.
3. Configure boot devices. See "Enabling an Adapter to Boot from SAN" on page 88 for more information.
4. If desired, configure the boot options on the adapter. See "Configuring Advanced Adapter Parameters" on page 93 for more information.
5. Use the driver on the operating system distribution disk to boot the system. If necessary, you can update the driver to the latest version.

Solaris

Configuring Boot from SAN on Solaris SFS (x86 and x64)

To configure boot from SAN:

1. If necessary, update the boot code on the adapter. See chapter 7., "Updating and Enabling Boot Code," on page 104 for more information.
2. If necessary, enable the boot code on the adapter. See chapter 7., "Updating and Enabling Boot Code," on page 104 for more information.
3. Enable the adapter to boot from SAN. See "Enabling an Adapter to Boot from SAN" on page 88 for more information.
4. If necessary, enable spinup delay. See "Enabling or Disabling the Spinup Delay" on page 97 for more information.
5. Configure boot devices. See "Configuring Boot Devices" on page 90 for more information.
6. If desired, configure the boot options on the adapter. See "Configuring Advanced Adapter Parameters" on page 93 for more information.
7. Boot the Solaris installation CD and follow the prompts.

   Note: If you need help determining the LUNs to select for boot from SAN, see "Determining LUNs to Select for Boot from SAN" on page 72.

Determining LUNs to Select for Boot from SAN

To determine which LUNs to select:

1. Open a terminal window and leave it open.
2. In the terminal window, select the LUN you are going to use as the SAN boot disk (not the local drive) using the luxadm probe command. This shows all the available LUNs. Record this LUN information, which is used throughout this procedure. LUN 0 is used in the example:

   ```
   luxadm probe

   Found Fibre Channel device(s):
      Node WWN:50060e8003823800 Device Type:Disk device
      Logical Path:/dev/rdsk/c5t226000C0FF9833AFd6s2
      Node WWN:50060e8003823800 Device Type:Disk device
      Logical Path:/dev/rdsk/c5t226000C0FF9833AFd6s2
   Node WWN:50060e8003823800 Device Type:Disk device
   ```
3. Copy the /dev/rdsk/*nnn* part of the path statement for a drive.
4. In the terminal window, use the luxadm display command to show the WWPN or the LUN for which you selected the path in the prior step:

   `luxadm display </dev/rdsk/nnn>`
5. Record this LUN or WWPN information for use in the procedure.

Configuring Boot from SAN on Solaris SFS (SPARC)

To configure boot from SAN:

1. If necessary, update the boot code on the adapter. See chapter 7., “Updating and Enabling Boot Code,” on page 104 for more information.
2. If necessary, enable the boot code on the adapter. See chapter 7., “Updating and Enabling Boot Code,” on page 104 for more information.
3. Type the following at the OBP prompt:

   ```
   show-devs
   ```

   The ID information for each found adapter is displayed, such as:

   ```
   /pci@22,600000/pci@0/pci@9/pci@0/pci@9/emlx@0
   ```

4. Enable boot from SAN on each Emulex adapter in the system by typing the following set of commands, replacing adapter_id with the ID information (such as shown above), for each Emulex adapter in turn. There is a space between the first quotation mark and the first character of the adapter ID.

   ```
   " adapter_id" select-dev [for example,
   “ /pci@22,600000/pci@0/pci@9/pci@0/pci@9/emlx@0” select-dev]
   set-sfs-boot
   unselect-dev
   ```

5. After all Emulex adapters have been enabled to boot from SAN, reset the system with the following command:

   ```
   reset-all
   ```

6. After the system resets, boot the Solaris installation CD and follow the prompts.
7. After the installation completes successfully, you will be prompted to reboot or exit the system. Press **<!>** and then press the **<Enter>** key to go to the Unix prompt.
8. Once the Unix prompt appears, append the following line to the system file at /a/etc/system:

   ```
   set pcie:pcie_max_mps=0
   ```

9. Save and reboot server.

Installing Solaris from a Network Image

The system must have a DVD drive and must be part of the site's network and naming service. If you use a naming service, the system must already be in the service, such as NIS, NIS+, DNS, or LDAP. If you do not use a naming service, you must distribute information about this system by following your site's policies.

Note: This procedure assumes that the system is running the Volume Manager. If you are not using the Volume Manager to manage media, refer to the Sun Microsystems System Administration Guide: Devices and File Systems.

To install from a network image:

1. Log on as a superuser or equivalent.
2. Insert the Solaris DVD in the system's drive.

3. Create a directory to contain the DVD image.

   ```
   # mkdir -p install_dir_path
   ```

   Install_dir_path specifies the directory where the DVD image is to be copied.

4. Change to the Tools directory on the mounted disc.

   ```
   # cd /cdrom/cdrom0/Solaris_10/Tools
   ```

   Note: For Solaris 10 only:

   a. Remove the SUNWemlxu and SUNWemlxs from /install_dir_path/Solaris/Tools/Boot.
   b. Unzip the elxfc driver to a temporary directory:

      ```
      pkgadd -R /install_dir_path/Solaris/Tools/Boot -d /tmp
      ```

   c. Modify the elxfc.conf file to use persistent binding. For more information, see the *Emulex Driver for Solaris User Manual*, which is available on the Emulex website.

5. Copy the DVD image in the drive to the install server's hard disk.

   ```
   # ./setup_install_server install_dir_path
   ```

   install_dir_path specifies the directory where the DVD image is to be copied.

   Note: The `setup_install_server` command indicates whether you have enough disk space available for the Solaris Software disc images. To determine available disk space, use the `df -kl` command.

6. Decide whether you need to make the installation server available for mounting:

   If the installation server is on the same subnet as the system to be installed or you are using DHCP, you do not need to create a boot server. Proceed to step 7.

   If the install server is not on the same subnet as the system to be installed and you are not using DHCP, complete the following steps.

   a. Verify that the path to the install server's image is shared appropriately.

      ```
      # share | grep install_dir_path
      ```

      install_dir_path specifies the path to the installation image where the DVD image was copied:

      - If the path to the install server's directory is displayed and anon=0 is displayed in the options, proceed to step 7.
      - If the path to the install server's directory is not displayed or you do not have anon=0 in the options, continue and make the install server available to the boot server. Using the share command, add this entry to the /etc/dfs/dfstab file (all on one line):

        ```
        share -F nfs -o ro,anon=0 -d "install server directory"
        install_dir_path
        ```

   b. Verify that the nfsd daemon is running, or start the nfsd daemon.

      - If the install server is running the current Solaris release, or compatible version, type the following command:

        ```
        # svcs -l svc:/network/nfs/server:default
        ```

- If the nfsd daemon is online, continue to step c.
- If the nfsd daemon is not online, start it. Type the following command:

```
# svcadm enable svc:/network/nfs/server
```

- If the install server is running the Solaris 9 operating system, or compatible version, type the following command:

```
# ps -ef | grep nfsd
```

- If the nfsd daemon is running, continue to step c.
- If the nfsd daemon is not running, start it.

```
# /etc/init.d/nfs.server start
```

c. Share the install server.

```
# shareall
```

7. Change directories to root (/).

```
# cd /
```

8. Eject the Solaris DVD.
9. (Optional) Patch the files that are located in the miniroot on the net install image that was created by setup_install_server. Patching a file might be necessary if a boot image has problems. For more information, see the *Sun Microsystems Solaris 10 10/08 Installation Guide*.

Installing Solaris by Migrating an Image from a Local SCSI Disk

To install Solaris by migrating an image from a local SCSI disk:

1. Type the following at the OBP prompt:

```
show-devs
```

   The ID information for each found adapter is displayed, such as:

```
/pci@5d,700000/emlx@1
```

2. Select the Emulex adapter on which you want to enable boot from SAN by entering the path to the adapter, for example:

```
" /pci@5d,700000/emlx@1" select-dev
```

3. To view the current boot device ID, type:

```
show-devs
" /pci@5d,700000/emlx@1" select-dev /* to select emlx@1 (for
example) */
.boot-id
```

   Make a note of the WWPN, DID, or AL_PA returned from the probe and write down the corresponding boot entry.

4. To enable boot from SAN, set the boot device ID to the SAN device from which you want to boot. For example:

```
" /pci@5d,700000/emlx@1" select-dev
wwpn|did|alpa lun target_id set-boot-id
unselect-dev
```

where:

- *wwpn* | *did* | *alpa* is the device WWPN, DID, or AL_PA of the storage device.
- *lun* is the LUN number in hexadecimal. To enter it in decimal, enter d# [*lun*].
- *target_id* is the target ID in hexadecimal. To enter it in decimal, enter d# [*target_id*].

Note: Emulex recommends using the WWPN in most cases. The DID and AL_PA may change between boots, causing the SAN boot to fail, unless the DID and AL_PA are specifically configured to not change between boots.

Example 1: alpa=e1, lun=100 (decimal) and target id=10 (decimal):

```
alpa e1 d# 100 d# 10 set-boot-id
```

Example 2: wwpn=50000034987AFE, lun=af (hexadecimal) and target id=10 (decimal):

```
wwpn 50000034987AFE af d# 10 set-boot-id
```

Example 3: did=6312200, lun=25 (hexadecimal) and target id=f (hexadecimal):

```
did 6312200 25 f set-boot-id
```

5. Boot to the original local disk to set up the FC disk that you just defined. Type:

   ```
   boot local_disk
   ```

   where *local_disk* is the complete path or the alias of the original boot disk.

6. Run the format utility:

   ```
   format
   ```

7. Select the target disk to become the new boot disk (for example, c1t1d0).
8. Select the partition option and partition the disk as desired.
9. Select the label option and write a volume label to the target disk.

   For help with the format utility, see the man page *man format*.

10. Install the boot on partition 0 of the target disk. (Type this command as one line.)

    ```
    installboot /usr/platform/ `uname -i`/lib/fs/ufs/bootblk
    /dev/rdsk/clt1d0s0
    ```

11. Create a filesystem for each partition that contains a mounted filesystem:

    ```
    newfs -v /dev/rdsk/clt1d0s0 (becomes root)
    newfs -v /dev/rdsk/clt1d0s6 (becomes usr)
    newfs -v /dev/rdsk/clt1d0s7 (becomes export/home)
    ```

12. Create temporary mount points for the new partitions:

    ```
    mkdir root2
    mkdir usr2
    mkdir export2
    ```

13. Mount, copy, then unmount the usr2 file system:

    ```
    mount /dev/dsk/clt1d0s6 /usr2
    c0t0d0s6 ufsdump 0f - /dev/rdsk/c0t0d0s6 | (cd /usr2; ufsrestore
    rf -)
    ```

```
umount /usr2
```

14. Copy the export/home file system:

```
mount /dev/dsk/c1t1d0s7 /export2
ufsdump 0f - /dev/rdsk/c0t0d0s7 | (cd /export2; ufsrestore rf -)
umount /export2
```

15. Perform copy:

```
mount /dev/dsk/c1t1d0s0 /root2
ufsdump 0f - /dev/rdsk/c0t0d0s0 | (cd /root2; ufsrestore rf -)
```

16. Edit /root2/etc/vfstab, changing the controller number, target number and LUN number to point to the new FC boot disk. For example, if the FC boot disk is c1t1d0, replace all local disk entries of c0t0d0 with c1t1d0.

    Currently file shows:

```
/dev/dsk/c0t0d0s1 (swap)

/dev/dsk/c0t0d0s0 and /dev/rdsk/c0t0d0s0 (root)
/dev/dsk/c0t0d0s6 and /dev/rdsk/c0t0d0s6 (usr)
/dev/dsk/c0t0d0s7 and /dev/rdsk/c0t0d0s7 (export)
```

    Edit file to show:

```
/dev/dsk/c1t1d1s1 (swap)

/dev/dsk/c1t1d0s0 and /dev/rdsk/c1t1d0s1 (root)
/dev/dsk/c1t1d0s6 and /dev/rdsk/c1t1d0s6 (usr)
/dev/dsk/c1t1d0s7 and /dev/rdsk/c1t1d0s7 (export)
```

17. Reboot the system:

```
sync
halt
reset-all
```

18. Boot to disk:

```
boot disk
```

    The system should boot to the FC disk.

19. View the current dump device setting:

```
dumpadm
```

20. Change the dump device to the swap area of the FC drive:

```
dumpadm -d /dev/dsk/c1t1d0s1
```

    where /dev/dsk/c1t1d0s1 is a sample path to the swap area of the FC drive.

Booting Solaris 10 from the Network on SPARC Machines

To boot from the network:

1. Set up the install server and the boot server (if required). See the topic for Network-Based Installations in the *Solaris 10 10/09 Installation Guide*.
2. Obtain the MAC address of the OCE port used for the net boot:
   a. Get the device path of the port from the show-devs command:

```
{0} ok show-devs
/pci@0/pci@0/pci@8/pci@0/pci@1/emlx@0,3
/pci@0/pci@0/pci@8/pci@0/pci@1/emlx@0,2
/pci@0/pci@0/pci@8/pci@0/pci@1/oce@0,1
/pci@0/pci@0/pci@8/pci@0/pci@1/oce@0
/pci@0/pci@0/pci@8/pci@0/pci@1/emlx@0,3/fp@0,0
```

   b. Select the OCE device to boot:

```
{0} ok " /pci@0/pci@0/pci@8/pci@0/pci@1/oce@0,1" select-dev
```

   c. Get the MAC address of the selected device from its properties:

```
{0} ok .properties
status                   okay
assigned-addresses       82020014 00000000 00100000 00000000 00004000
                         82020018 00000000 00120000 00000000 00020000
                         82020020 00000000 00140000 00000000 00020000
                         82020030 00000000 00180000 00000000 00080000
model                    OCe10102
fcode-version            4.0.0.0
reg                      00020000 00000000 00000000 00000000 00000000
                         02020014 00000000 00000000 00000000 00004000
                         03020018 00000000 00000000 00000000 00020000
                         03020020 00000000 00000000 00000000 00020000
                         02020030 00000000 00000000 00000000 00040000
compatible               pciex19a2,700.10df.e602.2
                         pciex19a2,700.10df.e602
                         pciex19a2,700.2
                         pciex19a2,700
                         pciexclass,020000
                         pciexclass,0200
max-frame-size           000005ee
address-bits             00000030
supported-network-types  ethernet,10000,null,full
copyright                Copyright (c) 2009-2011 Emulex. All rights
reserved.
name                     oce
device_type              network
manufacturer             Emulex
fcode-rom-offset         00016e00
interrupts               00000001
cache-line-size          00000010
class-code               00020000
```

```
subsystem-id            0000e602
subsystem-vendor-id     000010df
revision-id             00000002
device-id               00000700
vendor-id               000019a2
```

3. Add the MAC address from step 2 as an installation client to the Install/Boot server.
4. Power on the client machine and wait for the ok prompt.
5. Set the net device alias for the device selected in step 2.
   - If the net device alias is already set to the network device to be used for the net boot, skip this step.
   - If the net device alias is not set, set the net device alias to the network device that to be used for the net boot. Type:

     ```
     {0} ok devalias net <device_path>
     ```
6. Boot from the network.
   - If using the DHCP boot strategy, type:

     ```
     {0} ok boot net:dhcp
     ```
   - If using the RARP boot strategy, type:

     ```
     {0} ok boot net:rarp
     ```

5. Configuring x86/x64 Platforms for the iSCSI Protocol

iSCSI Overview

iSCSI is an IP-based standard for linking data-storage devices over a network and transferring data by carrying SCSI commands over IP networks. An iSCSI network consists of one or more iSCSI storage units (targets) connected through a copper or optical networking cable to 10Gb Ethernet network switches and/or IP routers. One or more servers are connected to this network, which are responsible for transferring data to or from the storage units.

When an operating system receives a request, it generates the SCSI command and then sends an IP packet over an Ethernet connection. At the receiving end, the SCSI commands are separated from the request, and the SCSI commands and data are sent to the SCSI controller and then to the SCSI storage device. iSCSI also returns a response to the request using the same protocol.

Constructing a Basic iSCSI SAN

There are three main components that make up an iSCSI SAN:

- iSCSI Initiator(s) – The initiator allows a given machine access to the storage available in the iSCSI SAN. It requests all SCSI operations like read or write. An initiator is usually located on the host/server side, either as hardware (iSCSI adapter) or software (iSCSI software initiator). To transport block (SCSI) commands over the IP network, an iSCSI driver must be installed on the iSCSI host. An iSCSI driver is included with the Emulex adapter. For more information on iSCSI initiators, see chapter 9., "Configuring and Managing the iSCSI Initiator with the iSCSISelect Utility," on page 108.
- iSCSI Target(s) – An iSCSI SAN has one or more iSCSI targets, which house and make available the storage used within the SAN. The iSCSI target is the storage device itself or an appliance that controls and serves volumes or virtual volumes. The target is the device that performs the SCSI command or bridges it to an attached storage device. iSCSI targets can be disks, RAID arrays, or even FC fabrics. For additional information on iSCSI targets, see chapter 10., "Configuring and Managing iSCSI Targets with the iSCSISelect Utility," on page 119.
- Networking infrastructure – The networking infrastructure in an iSCSI SAN uses Ethernet transport. The configuration and complexity of the storage network depends on its intended function and the required capabilities.

Managing an iSCSI Session

To transmit information from an iSCSI initiator to an iSCSI target, the initiator must first establish a session with the target through an iSCSI login process. The login process:

- Starts a TCP/IP connection.
- Verifies that the iSCSI initiator has access to the iSCSI target (authentication).
- Allows negotiation of various parameters.

Logging into an iSCSI Session

An iSCSI session has two phases:

- Login Phase – iSCSI parameters are negotiated using login requests and responses.
- Full Featured Phase – Once security/authentication has occurred and operational parameters have been set, the initiator begins to perform SCSI I/Os.

Security

Because the iSCSI protocol operates in the Internet environment, security is critical. The iSCSI SAN uses the CHAP security method.

CHAP Authentication

CHAP is used to periodically verify the identity of the initiator by the target using a challenge/response mechanism. The challenge/response is established on the initial link and may repeated at any time afterward. For CHAP to work, the target must know the initiator's secret key, and the initiator must correctly respond to the challenge.

Although the authentication is only one-way, you can negotiate CHAP in both directions for mutual authentication, with the help of the same secret set.

Configuring for the iSCSI Protocol

This section provides instructions for configuring boot from SAN for iSCSI on various operating systems using the iSCSISelect utility. It also provides information on how to use the iSCSISelect utility to perform an MPIO boot configuration.

Setting Up Boot from SAN for iSCSI

In iSCSI target configuration, you have the option of setting dual network paths to a single boot LUN. You must follow these steps in this order to configure boot support successfully for each operating system.

1. Use the iSCSISelect utility to configure a boot target.

   Note: iSCSI must be enabled for the port before configuring a boot target.

2. Complete the normal operating system installation.

Windows Server

To set up boot from SAN for iSCSI on Windows Server:

1. Log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
2. Use the iSCSISelect utility to log into a target from one adapter and configure it for boot. For more information, see chapter 9., "Configuring and Managing the iSCSI Initiator with the iSCSISelect Utility," on page 108 and chapter 10., "Configuring and Managing iSCSI Targets with the iSCSISelect Utility," on page 119.

   If the iSCSISelect utility is configured properly, a message during boot time indicates that the iSCSI disk was successfully connected.
3. Install a Windows Server operating system over the iSCSI LUN.

Linux and Citrix Servers

To set up boot from SAN for iSCSI on Linux or Citrix:

1. Log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
2. Use the iSCSISelect utility to log into a target from one adapter and configure it for boot. For more information, see chapter 9., "Configuring and Managing the iSCSI Initiator with the iSCSISelect Utility," on page 108 and chapter 10., "Configuring and Managing iSCSI Targets with the iSCSISelect Utility," on page 119.

   If the iSCSISelect utility is configured properly, a message during boot time indicates that the iSCSI disk was successfully connected.
3. Install a Linux operating system over the iSCSI LUN. For more information, refer to the *Emulex Driver for Linux User Manual*, which is available on the Emulex website. For iSCSI boot, you will need the following information:

   For RHEL operating systems:

   a. When running the vmlinuz command, include the **dd** parameter to indicate that a driver update will be done.
   b. When prompted for the type of device your installation involves, choose "Specialized Storage Devices".
   c. When prompted to select the drives on which you will install the operating system or any drives you want to automatically mount to the system, select the iSCSI target device on the "Other SAN Devices" tab.

   For SLES operating systems:

   a. Set withiscsi=1 to indicate that a driver update will be done.
   b. When prompted, click **Configure iSCSI Disks** to perform target login.

   Note: You may need to run certain iscsiadm commands to load the disk after the iSCSI driver is installed. See the iscsiadm documentation for additional information.

ESXi Server

To install and configure boot from SAN on ESXi Server:

1. Log into the iSCSISelect utility pressing **<Ctrl+S>** when prompted.
2. Use the iSCSISelect utility to log into a target from one adapter and configure it for boot. For more information, see chapter 9., "Configuring and Managing the iSCSI Initiator with the iSCSISelect Utility," on page 108 and chapter 10., "Configuring and Managing iSCSI Targets with the iSCSISelect Utility," on page 119.

   If the iSCSISelect utility is configured properly, a message during boot time indicates that the iSCSI disk was successfully connected.
3. Install an ESXi Server operating system over the iSCSI LUN. For more information, refer to the *Emulex Driver for VMware User Manual*, which is available on the Emulex website.

Booting from SAN for iSCSI MPIO

MPIO support allows the initiator to log in dual sessions to the same target. In this way I/O can be sent over either TCP/IP connection to the target. If one session fails another session can continue processing I/O without interruption to the application. In iSCSI target configuration, you have the option of setting dual network paths to a single boot LUN.

Note: Although MPIO boot support allows the initiator to log into multiple sessions, the iSCSI BIOS currently limits the number of sessions to two iSCSI sessions for a single boot LUN.

You must follow these steps in this order to configure MPIO boot support for each operating system.

1. Use the iSCSISelect utility to configure the first path to a boot target.
2. Complete normal operating system installation.
3. Install third-party MPIO software for your operating system.
4. Configure the second path to a single boot LUN through the iSCSISelect utility.

Windows Server

To install and configure MPIO on Windows Server:

1. Log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
2. Use the iSCSISelect utility to log into a target from one adapter and configure it for boot by following the steps in "Setting Up a Basic iSCSI Boot Configuration" on page 105.

   If the iSCSISelect utility is configured properly, a message during boot time indicates that the iSCSI disk was successfully connected.

   Note: Only one instance of the boot LUN must be visible to the server during the installation. The installation might fail if multiple instances of the boot LUN are available to the server. Emulex recommends that the Spanning Tree

Protocol be disabled on any ports that are connected to Windows Server 2008 or 2012 hosts booting via iSCSI. The Spanning Tree Protocol is used to calculate the best path between switches where there are multiple switches and multiple paths through the network.

3. Install a Windows Server operating system over the iSCSI LUN.
4. Once Windows Server is installed, install the MPIO software (such as Microsoft iSCSI Initiator), and reboot the system.
5. After rebooting, ensure that the boot LUN is detected by the MPIO driver. This can be done by either of the following two methods:
   - For Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2:
     - Look at the driver name for the disk device from Device Manager,

     -or-

     - Use the MPIO GUI to check for device ID `MS FT2005iSCSIBusType_0x9` under the MPIO Devices tab. The Disk Manager does not show duplicate disks.
6. Reboot your system and log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
7. You can now add an additional boot path with the iSCSISelect utility.

   To add an additional boot path to the same iSCSI LUN:

   a. Follow the steps for the "Windows Server" on page 82 to set up the second path.
   b. At the Add/Ping iSCSI Target menu, make sure you set a valid ISID Qualifier before adding your target. For more information on the ISID Qualifier, see "Setting an ISID Value" on page 125.
   c. After you have logged into the target, from the iSCSI Target Configuration menu, set the Boot Target option for the second target to **Yes**.
   d. Press **<F7>** to display the LUNs behind the target.
   e. Select the same LUN you chose for your initial boot LUN, then press **<F3>** to set it to bootable.
8. After Windows Server boots up, the MPIO installs drivers on the second path and prompts for reboot. Reboot the server.

Linux and Citrix Servers

To install and configure MPIO on Linux or Citrix:

1. Log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
2. Use the iSCSISelect utility to log into a target from one adapter and configure it for boot by following the steps for the "Linux and Citrix Servers" on page 82.

   If the iSCSISelect utility is configured properly, a message during boot time indicates that the iSCSI disk was successfully connected.

3. Install a Linux operating system over the iSCSI LUN. For more information refer to the *Emulex Driver for Linux User Manual*, which is available on the Emulex website. For iSCSI boot, you will need the following information:

   For RHEL operating systems:

   a. When running the vmlinuz command, include the **dd** parameter to indicate that a driver update will be done.
   b. When prompted for the type of device your installation involves, choose "Specialized Storage Devices".
   c. When prompted to select the drives on which you will install the operating system or any drives you want to automatically mount to the system, select the iSCSI target device on the "Other SAN Devices" tab.

   For SLES operating systems:

   a. Set withiscsi=1 to indicate that a driver update will be done.
   b. When prompted, click **Configure iSCSI Disks** to perform target login.

   Note: You may need to run certain iscsiadm commands to load the disk after the iSCSI driver is installed. See the iscsiadm documentation for additional information.

4. Once Linux is installed, install the MPIO software and reboot the system.
5. After rebooting, ensure that the boot LUN is detected by the MPIO driver. Perform either of the following steps:
   - To see if the multipath is running, type:

     ```
     # /sbin/multipath
     ```

     -or-

   - To see if the multipath daemon is running, type:

     ```
     # ps -aelf | grep multipathd
     ```

6. If multipath is running, you can view the current multipath topology. To view the current multipath topology, type:

   ```
   # /sbin/multipath -l
   ```

7. Reboot your system and log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
8. Use the iSCSISelect utility to add an additional boot path to the same iSCSI LUN. To do this, follow these steps:
   a. Follow the steps for the "Linux and Citrix Servers" on page 82 to set up the second path.
   b. When you get to the Add/Ping iSCSI Target menu, make sure you set a valid ISID Qualifier before adding your target. For more information on the ISID Qualifier, see "Setting an ISID Value" on page 125.
   c. After you have logged into the target, from the iSCSI Target Configuration menu, set the Boot Target option for the second target to **Yes**.
   d. Press **<F7>** to display the LUNs behind the target.

e. Select the same LUN you chose for your initial boot LUN, then press **<F3>** to set it to bootable.
f. Follow the instructions on the bottom of the menu screens until you are prompted to exit.
g. Save your changes before you exit.
h. Press **<Y>** to exit the iSCSISelect utility.

9. After Linux boots up, the MPIO installs drivers on the second path and prompts you to reboot. Reboot the server.

ESXi 5.0, 5.1, or 5.5 Server

To install and configure MPIO on ESXi Server:

1. Log into the iSCSISelect utility pressing **<Ctrl+S>** when prompted.
2. Use the iSCSISelect utility to log into a target from one adapter and configure it for boot by following the steps for the "ESXi Server" on page 83.

   If the iSCSISelect utility is configured properly, a message during boot time indicates that the iSCSI disk was successfully connected.
3. Install an ESXi server operating system over the iSCSI LUN. For more information refer to the *Emulex Driver for VMware User Manual*.
4. Once the ESXi server is installed, install the MPIO software and reboot the system. The ESXi Server is MPIO by default.
5. Use the iSCSISelect utility to add an additional boot path to the same iSCSI LUN. To do this, follow these steps:
   a. Follow the steps for the "ESXi Server" on page 83 to set up your second path.
   b. When you access the Add/Ping iSCSI Target menu, set a valid ISID Qualifier before adding your target. For more information, see "Setting an ISID Value" on page 125.
   c. After you have logged into the target, from the iSCSI Target Configuration menu, set the Boot Target option for the second target to **Yes**.
   d. Press **<F7>** to display the LUNs behind the target.
   e. Select the same LUN you chose for your initial boot LUN, then press **<F3>** to set it to bootable.
   f. Follow the instructions on the bottom of the menu screens until you are prompted to exit.
   g. Save your changes before you exit.
   h. Press **<Y>** to exit the iSCSISelect utility.

   After the ESXi Server boots up, the MPIO installs drivers on the second path and prompts for a reboot.
6. Reboot the server.

6. Using the FCoE Boot BIOS Utility for x86 and x64 Architectures

Before using the FCoE BIOS utility, ensure that the boot code is loaded and enabled on the adapter as described in "Updating and Enabling Boot Code" on page 104.

Note: This section reflects the most recent release of the FCoE BIOS utility. Some selections may not be available if you are using an older version of the utility.

Note: After exiting the FCoE BIOS configuration utility, the system will reboot whether or not any changes have been made.

Navigating the FCoE BIOS Utility

The FCoE BIOS utility has menus and configuration screens. Use the following methods to navigate them:

- Press the up/down arrows on your keyboard to move through and select menu options or configuration fields. When multiple adapters are listed, use the up/down arrows to scroll to the additional adapters.
- Press **<PageUp>** to scroll to the previous page.
- Press **<PageDn>** to scroll to the next page.
- Press **<Enter>** to select a menu option, to select a changed value, to select a row in a configuration screen or to change a configuration default.
- Press **<Esc>** to go back to the previous menu.

Starting the FCoE BIOS Utility

Note: Links must be established before entering the FCoE BIOS utility; otherwise, you will receive an error message.

To start the FCoE BIOS utility:

1. Turn on the computer and press and hold down **<Alt>** or **<Ctrl>** and press **<E>** immediately (within five seconds) when the Emulex bootup message to start the FCoE BIOS utility is displayed. An adapter listing is displayed (Figure 6-1).

   Note: If the bootup message does not appear, you must enable x86 BootBIOS. For more information, see "Updating and Enabling Boot Code" on page 104.

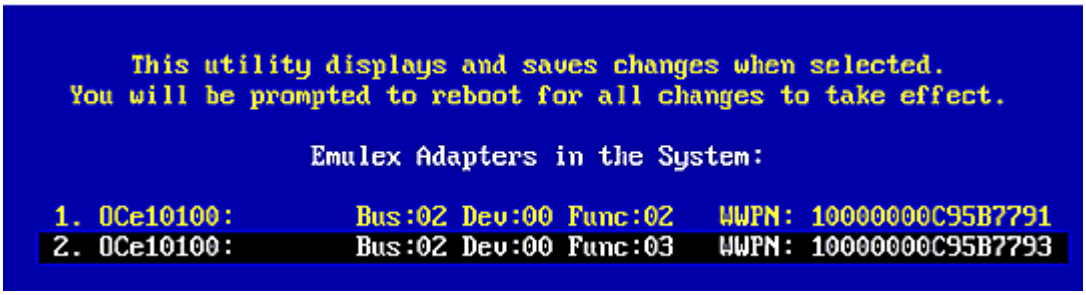
This utility displays and saves changes when selected.
You will be prompted to reboot for all changes to take effect.
Emulex Adapters in the System:
1. OCe10100: Bus:02 Dev:00 Func:02 WWPN: 10000000C95B7791
2. OCe10100: Bus:02 Dev:00 Func:03 WWPN: 10000000C95B7793

Figure 6-1 Emulex Adapter Listing

2. Select the adapter to configure and press **<Enter>**. The main configuration menu is displayed (Figure 6-2).

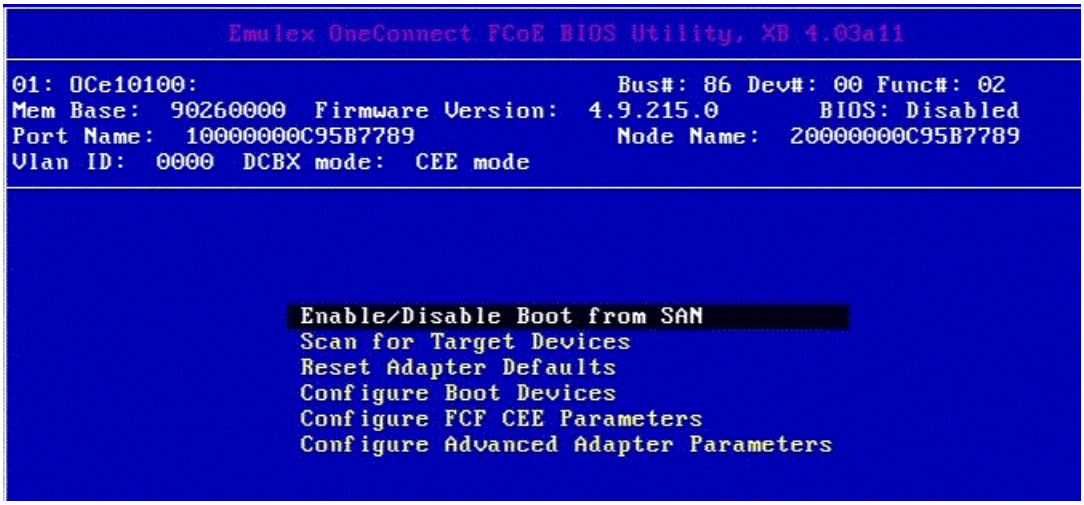
Emulex OneConnect FCoE BIOS Utility, XB 4.03a11
01: OCe10100: Bus#: 86 Dev#: 00 Func#: 02
Mem Base: 90260000 Firmware Version: 4.9.215.0 BIOS: Disabled
Port Name: 10000000C95B7789 Node Name: 20000000C95B7789
Vlan ID: 0000 DCBX mode: CEE mode
Enable/Disable Boot from SAN
Scan for Target Devices
Reset Adapter Defaults
Configure Boot Devices
Configure FCF CEE Parameters
Configure Advanced Adapter Parameters

Figure 6-2 Main Configuration Menu

Under normal circumstances, you would first configure boot devices using the BIOS Utility. However, if the adapter is not enabled to boot from SAN, you must first enable the adapter to do so.

Enabling an Adapter to Boot from SAN

To enable an adapter to boot from SAN, from the Main configuration menu, select **Enable/Disable Boot from SAN** and press **<Enter>**.

Note: Adapters are disabled by default.

At least one adapter must be enabled to boot from SAN in order to use remote boot functionality. Once you enable an adapter, the status of the boot BIOS changes as shown in Figure 6-3.

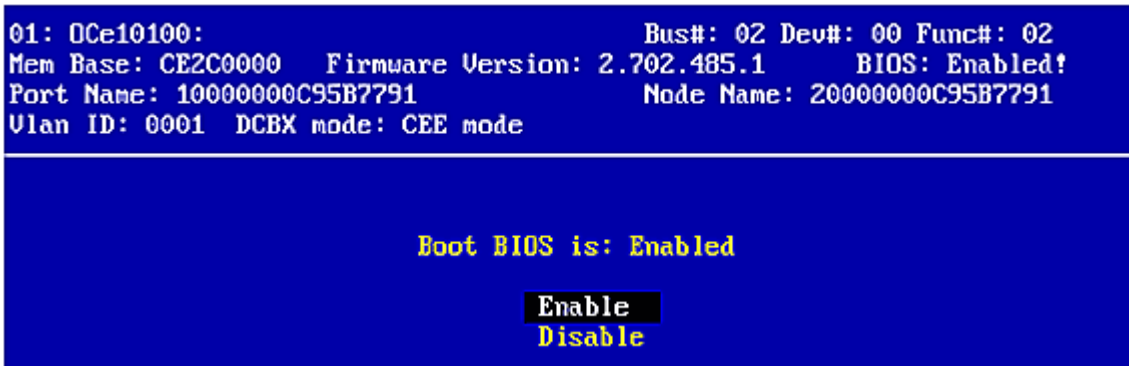

Figure 6-3 BIOS Status

Scanning for Target Devices

To scan for target devices:

1. From the Main configuration menu, select **Scan for Target Devices**. This option only displays a list of discovered target devices. It allows you to quickly verify zoning and SAN connectivity while providing a mechanism to log in ports for zoning.

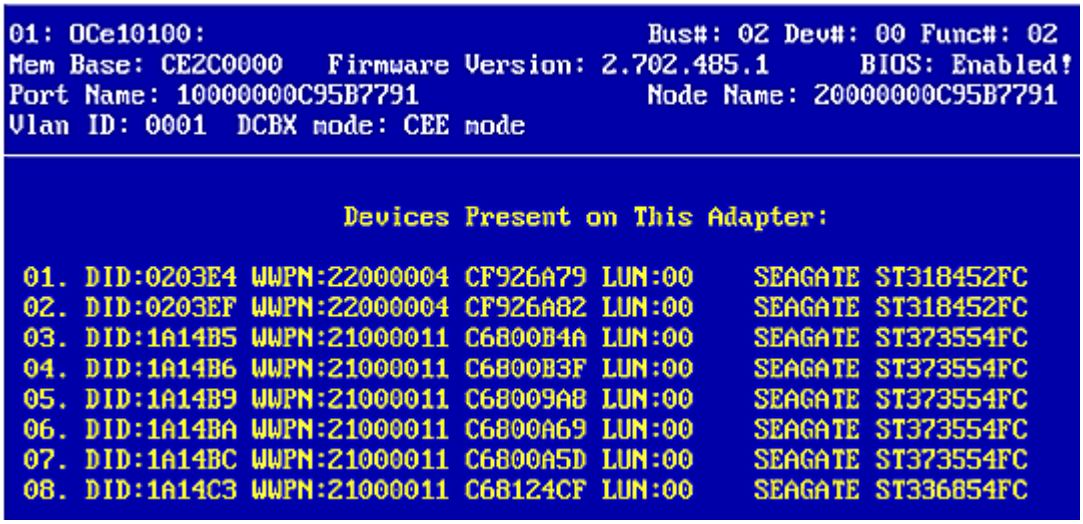
01: OCe10100:
Bus#: 02 Dev#: 00 Func#: 02
Mem Base: CE2C0000
Firmware Version: 2.702.485.1
BIOS: Enabled!
Port Name: 10000000C95B7791
Node Name: 20000000C95B7791
Vlan ID: 0001
DCBX mode: CEE mode
Devices Present on This Adapter:
01. DID:0203E4 WWPN:22000004 CF926A79 LUN:00 SEAGATE ST318452FC
02. DID:0203EF WWPN:22000004 CF926A82 LUN:00 SEAGATE ST318452FC
03. DID:1A14B5 WWPN:21000011 C6800B4A LUN:00 SEAGATE ST373554FC
04. DID:1A14B6 WWPN:21000011 C6800B3F LUN:00 SEAGATE ST373554FC
05. DID:1A14B9 WWPN:21000011 C68009A8 LUN:00 SEAGATE ST373554FC
06. DID:1A14BA WWPN:21000011 C6800A69 LUN:00 SEAGATE ST373554FC
07. DID:1A14BC WWPN:21000011 C6800A5D LUN:00 SEAGATE ST373554FC
08. DID:1A14C3 WWPN:21000011 C68124CF LUN:00 SEAGATE ST336854FC

Figure 6-4 Devices Present on the Adapter

2. Press **<Esc>** to return to the Main configuration menu.

Configuring Boot Devices

To configure boot devices:

1. On the main configuration menu (Figure 6-2), select **Configure Boot Devices** and press **<Enter>**.

   A list of eight boot devices is shown (Figure 6-5). Emulex recommends that you configure only the bootable devices. The primary boot device is the first entry shown. It is the first bootable device. If the first boot entry fails due to a hardware error, the system boots from the second bootable entry. If the second boot entry fails, the system boots from the third bootable entry and so on.

   Note: This assumes the system BIOS supports BBS and the boot order is set using the mapped drives.

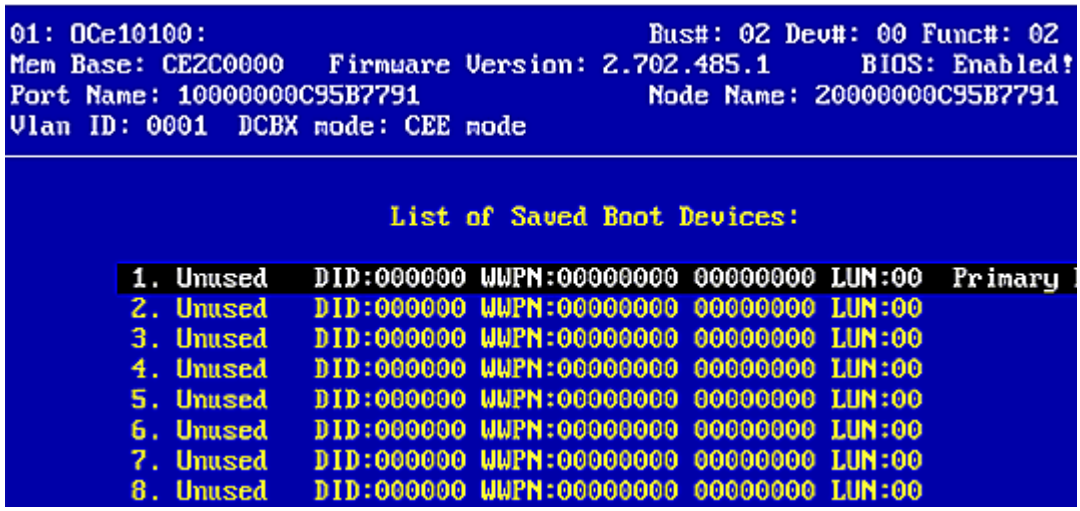

Figure 6-5 List of Saved Boot Devices Screen

2. Select a boot entry and press **<Enter>**. A screen similar to Figure 6-6 is displayed.

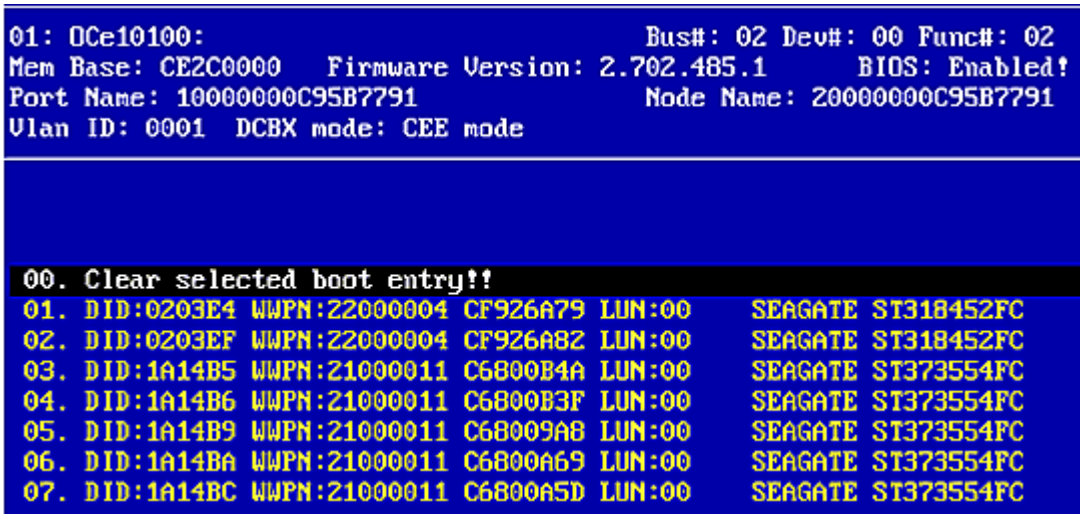
01: OCe10100: Bus#: 02 Dev#: 00 Func#: 02
Mem Base: CE2C0000 Firmware Version: 2.702.485.1 BIOS: Enabled!
Port Name: 10000000C95B7791 Node Name: 20000000C95B7791
Vlan ID: 0001 DCBX mode: CEE mode
00. Clear selected boot entry!!
01. DID:0203E4 WWPN:22000004 CF926A79 LUN:00 SEAGATE ST318452FC
02. DID:0203EF WWPN:22000004 CF926A82 LUN:00 SEAGATE ST318452FC
03. DID:1A14B5 WWPN:21000011 C6800B4A LUN:00 SEAGATE ST373554FC
04. DID:1A14B6 WWPN:21000011 C6800B3F LUN:00 SEAGATE ST373554FC
05. DID:1A14B9 WWPN:21000011 C68009A8 LUN:00 SEAGATE ST373554FC
06. DID:1A14BA WWPN:21000011 C6800A69 LUN:00 SEAGATE ST373554FC
07. DID:1A14BC WWPN:21000011 C6800A5D LUN:00 SEAGATE ST373554FC

Figure 6-6 Device Selection List Example Screen

3. Select **<00>** and press **<Enter>** to clear the selected boot entry, or select a device to configure booting by WWPN or DID and press **<Enter>**.
4. If you select a device, you are asked for the starting LUN. Use the up and down arrows to enter the starting LUN in hexadecimal format and press **<Enter>**. (Figure 6-7). The starting LUN can be any number from 0 to 255.

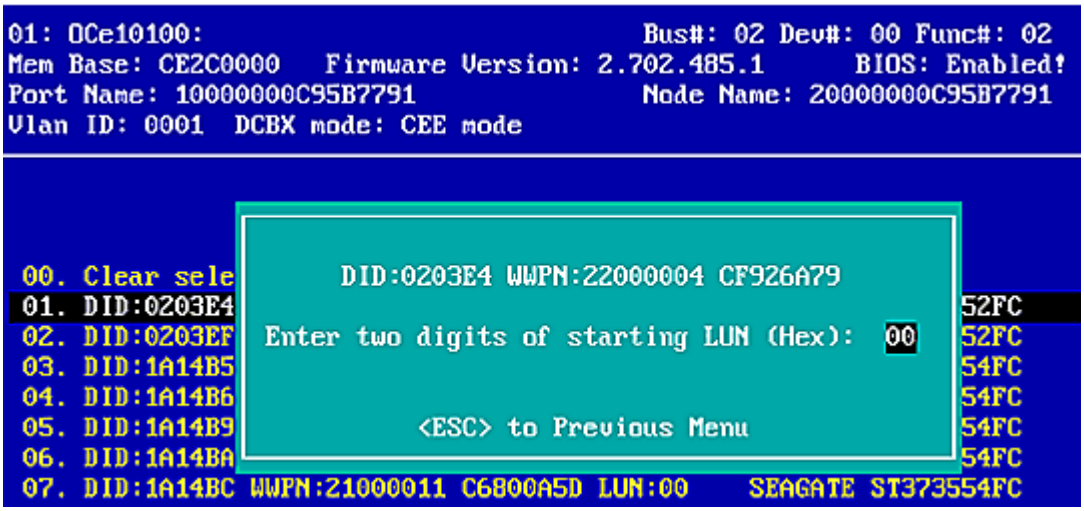

Figure 6-7 LUN Listing Screen

5. A screen similar to Figure 6-8 is displayed. Press **<Enter>**.

01: OCe10100: Bus#: 02 Dev#: 00 Func#: 02
Mem Base: CE2C0000 Firmware Version: 2.702.435.1 BIOS: Enabled!
Port Name: 10000000C95B7595 Node Name: 20000000C95B7595
Vlan ID: 0001 DCBX mode: CEE mode
DID:0203E4 WWPN:22000004 CF926A79
01. LUN:00 SEAGATE ST318452FC 0004

Figure 6-8 Boot Device Selected

The Boot Devices menu is displayed.

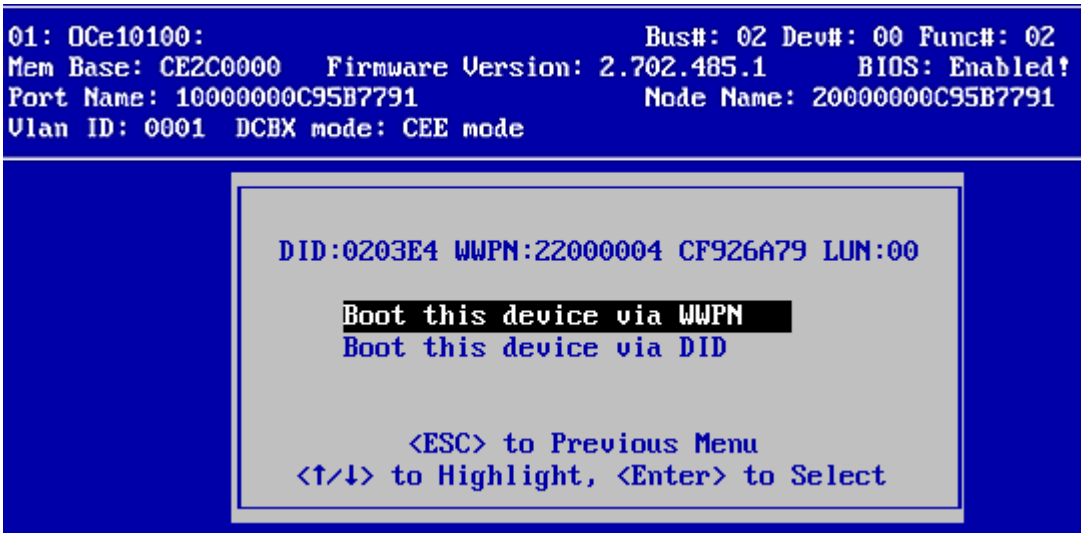

Figure 6-9 Boot Devices Menu

6. Use the up and down arrows to select the boot method. If you select to boot the device by WWPN, the WWPN of the earlier selected entry is saved in the flash memory. However, during the initial BIOS scan, the utility issues a Name Server Inquiry GID_PN (Get Port Identifier). Then, based on this DID, it continues with the remainder of the scanning.

   If you select to boot this device by DID, the earlier selected entry is saved in the flash memory.

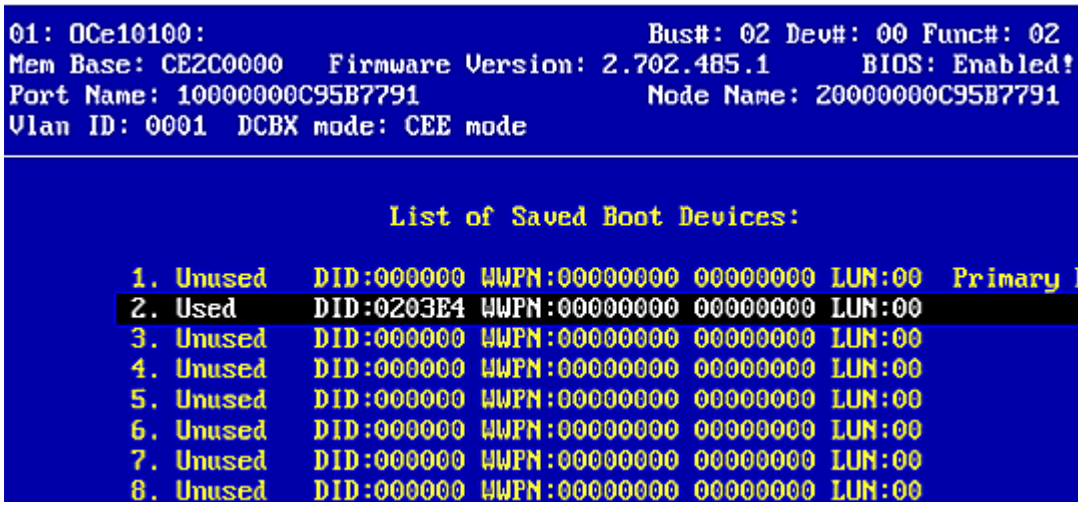

Figure 6-10 Primary Boot Device Set Up Screen

7. Press **<Enter>** to select the change.
8. Press **<Esc>** to return to the main configuration menu.
9. Reboot the system for the new boot path to take effect.

Configuring CEE Parameters

Note: For DCBX configuration, the adapter is always in CEE mode.

To configure CEE parameters:

1. If multiple VLANs or FCoE switches are set up and you want to select a particular VLAN to boot from every time, select **Configure FCF CEE Parameters** from the main configuration menu (Figure 6-2) and press **<Enter>**. A list of discovered FCF is displayed.

Adapter Boot Configuration Record:
D VLAN ID: *Any* Sw Name: ***Match Any*** , Fab Name: ***Match Any***
Boot/Active/Del, <Pg Dn> FCF Sel, <TAB> Field Sel, <ENTER> Save, <ESC> Exit
Select the discovered FCF you wish to write into this Adapter Record:
1. VLAN ID: 0008, Sw Name: 80EF47EC-0D000920, Fab Name: 81EF47EC-0D000820

Figure 6-11 FCF Listing

2. Select the FCF you want to boot from every time and save this to the adapter record by pressing **<Enter>**. The following message is displayed.

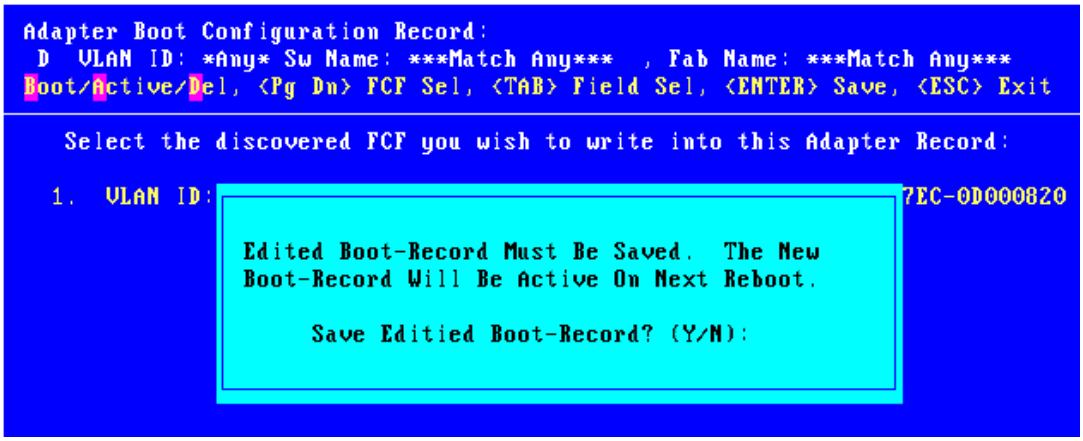
Adapter Boot Configuration Record:
D VLAN ID: *Any* Sw Name: ***Match Any*** , Fab Name: ***Match Any***
Boot/Active/Del, <Pg Dn> FCF Sel, <TAB> Field Sel, <ENTER> Save, <ESC> Exit
Select the discovered FCF you wish to write into this Adapter Record:
1. VLAN ID:
7EC-0D000820
Edited Boot-Record Must Be Saved. The New
Boot-Record Will Be Active On Next Reboot.
Save Edited Boot-Record? (Y/N):

Figure 6-12 Save Edited Boot Record Dialog Box

3. Type **<Y>** to save the boot record. The main configuration menu is displayed.

Configuring Advanced Adapter Parameters

The BIOS utility has numerous options that can be modified to provide different behavior. Use the BIOS utility to perform the following tasks:

- Change the default AL_PA of the adapter
- Change the PLOGI retry timer
- Enable or disable spinup delay
- Set autoscan
- Enable or disable EDD 3.0

- Enable or disable the start unit command
- Enable or disable the environment variable
- Enable or disable the auto boot sector

To access the adapter configuration menu, from the main configuration menu (Figure 6-2), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed.

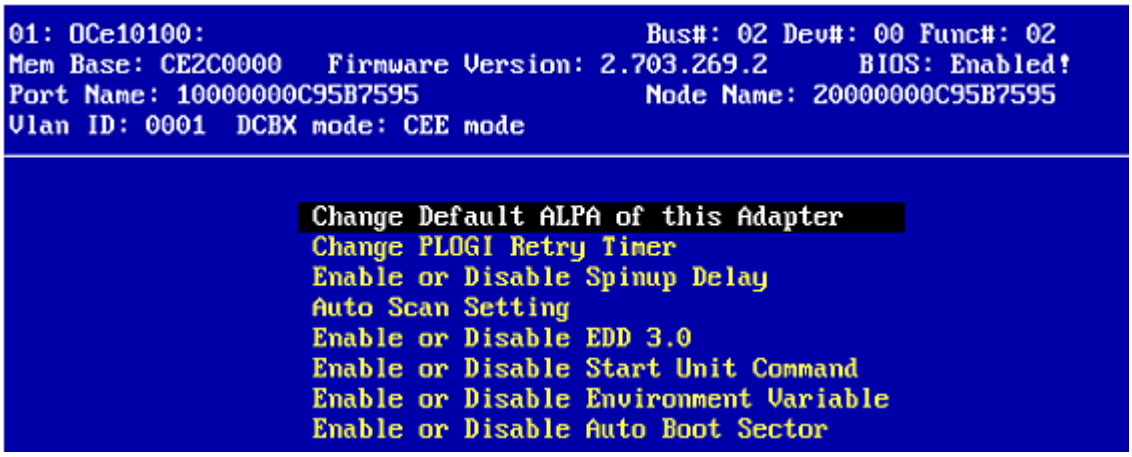
01: OCe10100: Bus#: 02 Dev#: 00 Func#: 02
Mem Base: CE2C0000 Firmware Version: 2.703.269.2 BIOS: Enabled!
Port Name: 10000000C95B7595 Node Name: 20000000C95B7595
Vlan ID: 0001 DCBX mode: CEE mode
Change Default ALPA of this Adapter
Change PLOGI Retry Timer
Enable or Disable Spinup Delay
Auto Scan Setting
Enable or Disable EDD 3.0
Enable or Disable Start Unit Command
Enable or Disable Environment Variable
Enable or Disable Auto Boot Sector

Figure 6-13 Advanced Adapter Configuration Menu

Default settings are acceptable for most installations.

To reset all values to their defaults, from the main configuration menu (Figure 6-2), select **Reset Adapter Defaults** and press **<Enter>**.

Changing the Default AL_PA

The default value of the AL_PA for the adapter BIOS is 00 (hex). All adapters or boot drives can be configured to other AL_PAs rather than their default values.

Note: This option applies only to arbitrated loop (FC-AL). The FCoE protocol does not support FC-AL.

To change the default AL_PA:

1. On the main configuration menu (Figure 6-2), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 6-13).

2. Select **Change Default ALPA** of this adapter and press **<Enter>**. Information similar to Figure 6-14 is displayed.

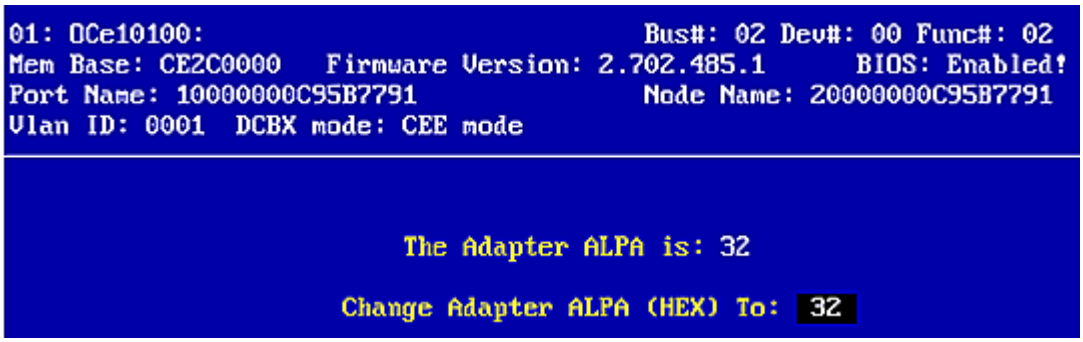
01: OCe10100: Bus#: 02 Dev#: 00 Func#: 02
Mem Base: CE2C0000 Firmware Version: 2.702.485.1 BIOS: Enabled!
Port Name: 10000000C95B7791 Node Name: 20000000C95B7791
Vlan ID: 0001 DCBX mode: CEE mode
The Adapter ALPA is: 32
Change Adapter ALPA (HEX) To: 32

Figure 6-14 Change Default ALPA Screen

3. Change the default AL_PA, use the up and down arrow keys to scroll through the valid AL_PAs. Table 6-1 lists the valid AL_PA values.
4. Press **<Enter>** to accept the new value.
5. Press **<Esc>** to return to the advanced adapter configuration menu.
6. For changes to take effect, reboot the system.

Note: If the adapter's AL_PA is changed, it does not show on the NVRAM AL_PA until the system has been reset.

Table 6-1 Valid AL_PA Values

0x00	0x01	0x02	0x04	0x08	0x0F	0x10	0x17
0x18	0x1B	0x1D	0x1E	0x1F	0x23	0x25	0x26
0x27	0x29	0x2A	0x2B	0x2C	0x2D	0x2E	0x31
0x32	0x33	0x34	0x35	0x36	0x39	0x3A	0x3C
0x43	0x45	0x46	0x47	0x49	0x4A	0x4B	0x4C
0x4D	0x4E	0x51	0x52	0x53	0x54	0x55	0x56
0x59	0x5A	0x5C	0x63	0x65	0x66	0x67	0x69
0x6A	0x6B	0x6C	0x6D	0x6E	0x71	0x72	0x73
0x74	0x75	0x76	0x79	0x7A	0x7C	0x80	0x81
0x82	0x84	0x88	0x8F	0x90	0x97	0x98	0x9B
0x9D	0x9E	0x9F	0xA3	0xA5	0xA6	0xA7	0xA9
0xAA	0xAB	0xAC	0xAD	0xAE	0xB1	0xB2	0xB3
0xB4	0xB5	0xB6	0xB9	0xBA	0xBC	0xC3	0xC5
0xC6	0xC7	0xC9	0xCA	0xCB	0xCC	0xCD	0xCE
0xD1	0xD2	0xD3	0xD4	0xD5	0xD6	0xD9	0xDA
0xDC	0xE0	0xE1	0xE2	0xE4	0xE8	0xEF	

Changing the PLOGI Retry Timer

This option is especially useful for Tachyon-based RAID arrays. Rarely, a Tachyon-based RAID array resets itself and the port goes offline temporarily. When the port returns to operation, the PLOGI retry interval scans the loop to discover this device. The PLOGI retry interval is the time it takes for one PLOGI to scan the whole loop. You can choose:

- No PLOGI Retry: 0 msec – default
- 50 msec takes 5 to 6 seconds per device (if 126 AL_PAs are on the loop)
- 100 msec takes 12 seconds per device (if 126 AL_PAs are on the loop)
- 200 msec takes 22 seconds per device (if 126 AL_PAs are on the loop)

To set the interval for the PLOGI retry timer:

1. On the main configuration menu (Figure 6-2), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 6-13).
2. Select **Change PLOGI Retry Timer** and press **<Enter>**. Information similar to Figure 6-15 is displayed.

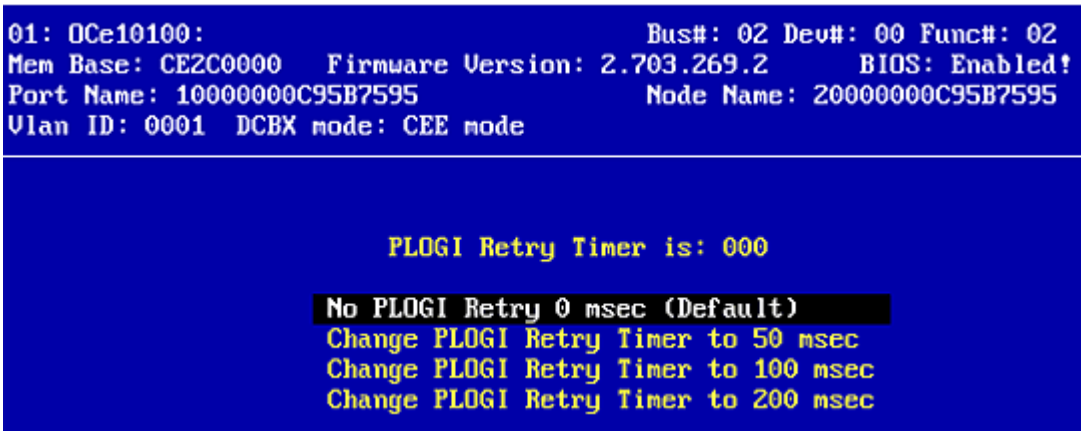
01: OCe10100: Bus#: 02 Dev#: 00 Func#: 02
Mem Base: CE2C0000 Firmware Version: 2.703.269.2 BIOS: Enabled!
Port Name: 10000000C95B7595 Node Name: 20000000C95B7595
Vlan ID: 0001 DCBX mode: CEE mode
PLOGI Retry Timer is: 000
No PLOGI Retry 0 msec (Default)
Change PLOGI Retry Timer to 50 msec
Change PLOGI Retry Timer to 100 msec
Change PLOGI Retry Timer to 200 msec

Figure 6-15 Change the PLOGI Retry Timer Screen

3. Select the retry timer interval.
4. Press **<Enter>** to accept the new interval.
5. Press **<Esc>** to return to the advanced adapter configuration menu.
6. For changes to take effect, reboot the system.

Enabling or Disabling the Spinup Delay

This option allows you to enable or disable the disk spinup delay. The factory default setting is disabled.

If at least one boot device has been defined, and the spinup delay is enabled, the boot BIOS searches for the first available boot device.

- If a boot device is present, the boot BIOS boots from it immediately.
- If a boot device is not ready, the boot BIOS waits for the spinup delay and, for up to three additional minutes, continues the boot scanning algorithm to find another multi-boot device.

If boot devices have not been defined, and auto scan is enabled, then the boot BIOS waits for five minutes before scanning for devices.

- In a private loop, the boot BIOS attempts to boot from the lowest target AL_PA it finds.
- In an attached fabric, the boot BIOS attempts to boot from the first target found in the NameServer data.

To enable or disable the spinup delay:

1. On the main configuration menu (Figure 6-2), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 6-13).
2. Select **Enable or Disable Spinup Delay** and press **<Enter>**. Information similar to Figure 6-16 is displayed.

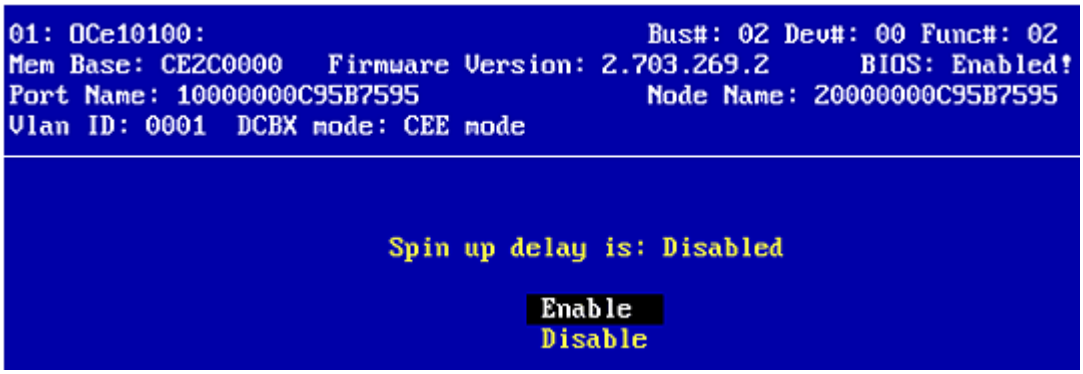
01: OCe10100: Bus#: 02 Dev#: 00 Func#: 02
Mem Base: CE2C0000 Firmware Version: 2.703.269.2 BIOS: Enabled!
Port Name: 10000000C95B7595 Node Name: 20000000C95B7595
Vlan ID: 0001 DCBX mode: CEE mode
Spin up delay is: Disabled
Enable
Disable

Figure 6-16 Enable or Disable Spinup Delay Screen

3. Select whether to enable or disable spinup delay.
4. Press **<Enter>** to accept the new value.
5. Press **<Esc>** to return to the advanced adapter configuration menu.
6. For changes to take effect, reboot the system.

Setting Auto Scan

This option allows you to set auto scan and enable the first device in the boot entry list to issue a Name Server Inquiry. Auto scan is available only if none of the eight boot entries is configured to boot from DID or WWPN. The factory default is disabled. If there is more than one adapter with the same PCI Bus number in the system, and each has a boot drive attached, the first PCI-scanned adapter is the boot adapter. The first adapter is usually in the lowest PCI slot in the system.

Use the Boot Devices menu (Figure 6-9) to configure up to eight boot entries for fabric point-to-point, public loop or private loop configurations. The first adapter is usually in the lowest PCI slot in the system. This device is the only boot device and it is the only device exported to the multi-boot menu.

Auto scan options:

- Autoscan disabled – default
- Any first device – The first adapter issues a Name Server Inquiry and the first D_ID from the inquiry becomes the boot device. The adapter attempts to log in to a public loop first. If it fails, it logs in to a private loop. The first successfully scanned device becomes the boot device. This device only is exported to the multi-boot menu.
- First LUN 0 device
- First NOT LUN 0 device (a device other than LUN 0)

To set auto scan:

1. From the main configuration menu (Figure 6-2), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 6-13).
2. Select **Auto Scan Setting** and press **<Enter>**. Figure 6-17 is displayed.

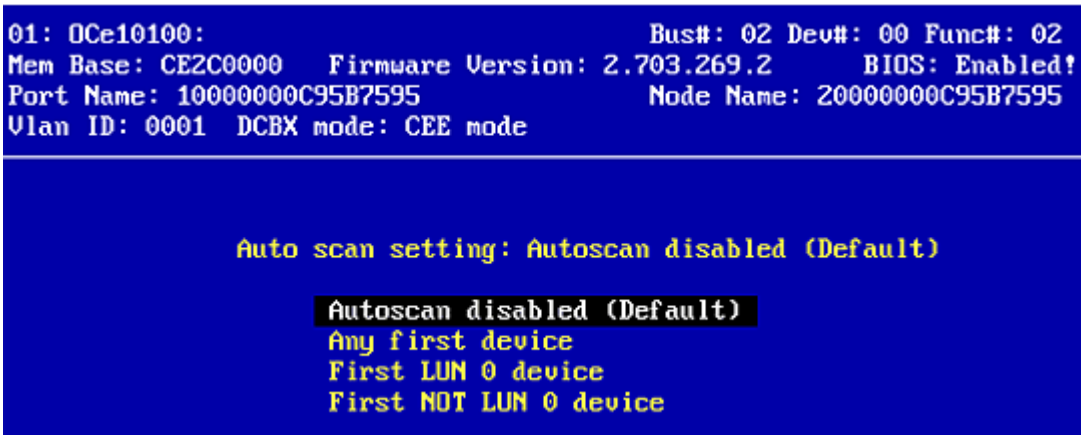
01: OCe10100: Bus#: 02 Dev#: 00 Func#: 02
Mem Base: CE2C0000 Firmware Version: 2.703.269.2 BIOS: Enabled!
Port Name: 10000000C95B7595 Node Name: 20000000C95B7595
Vlan ID: 0001 DCBX mode: CEE mode
Auto scan setting: Autoscan disabled (Default)
Autoscan disabled (Default)
Any first device
First LUN 0 device
First NOT LUN 0 device

Figure 6-17 Set Auto Scan Menu

3. Select the appropriate auto scan option.
4. Press **<Enter>** to accept the new scan option.
5. Press **<Esc>** to return to the advanced adapter configuration menu.
6. For changes to take effect, reboot the system.

Enabling or Disabling EDD 3.0

EDD 3.0 provides additional data to the operating system boot loader during an INT-13h function 48h call (get device parameters). This information includes the path to the boot device and the disk size. The default setting for EDD 3.0 is enabled. When EDD 3.0 is disabled, the setting reverts to EDD 2.1.

To enable or disable EDD 3.0:

1. From the main configuration menu (Figure 6-2), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 6-13).
2. Select **Enable or Disable EDD 3.0** and press **<Enter>**. The EDD 3.0 configuration screen is displayed.

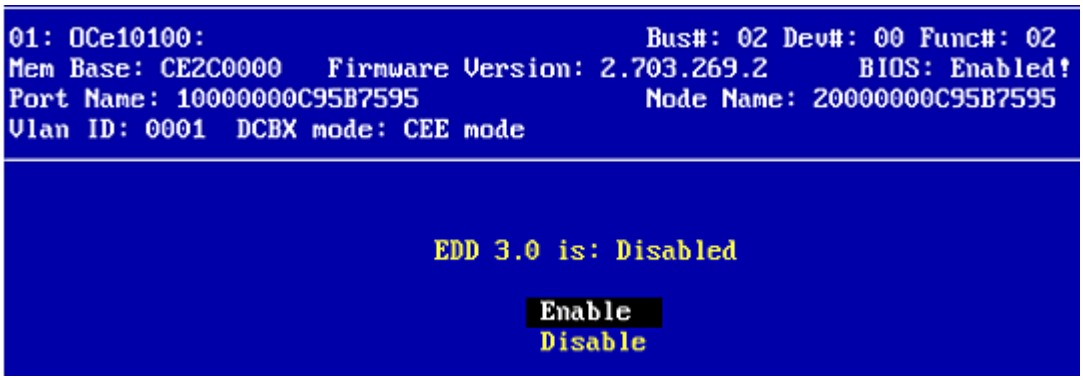

Figure 6-18 Enable or Disable EDD 3.0 Screen

3. Select whether to enable or disable EDD 3.0.
4. Press **<Enter>** to accept the change.
5. Press **<Esc>** to return to the advanced adapter configuration menu.
6. For changes to take effect, reboot the system.

Enabling or Disabling the Start Unit Command

You must know the specific LUN to issue the SCSI start unit command. The default setting is disabled.

To enable or disable the start unit command:

1. From the main configuration menu (Figure 6-2), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 6-13).
2. Select **Enable or Disable Start Unit Command** and press **<Enter>**. The Start Unit Command configuration screen is displayed.

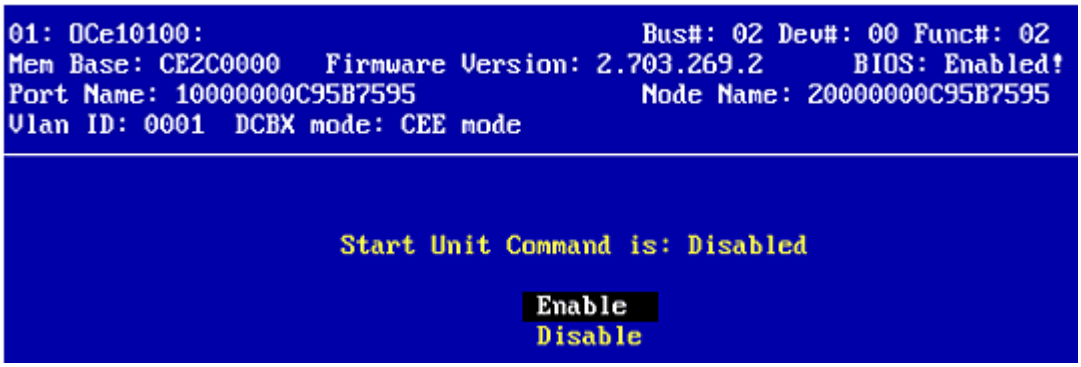

Figure 6-19 Enable or Disable Start Unit Command Screen

3. Select whether to enable or disable the start unit command.
4. Press **<Enter>** to select the change.
5. Press **<Esc>** to return to the advanced adapter configuration menu.
6. For changes to take effect, reboot the system.

Enabling or Disabling the Environment Variable

Sets the boot controller order if the system supports the environment variable. The default setting is disabled.

To enable or disable the environment variable:

1. From the main configuration menu (Figure 6-2), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 6-13).
2. Select **Enable or Disable Environment Variable** and press **<Enter>**. The Environment Variable configuration screen is displayed.

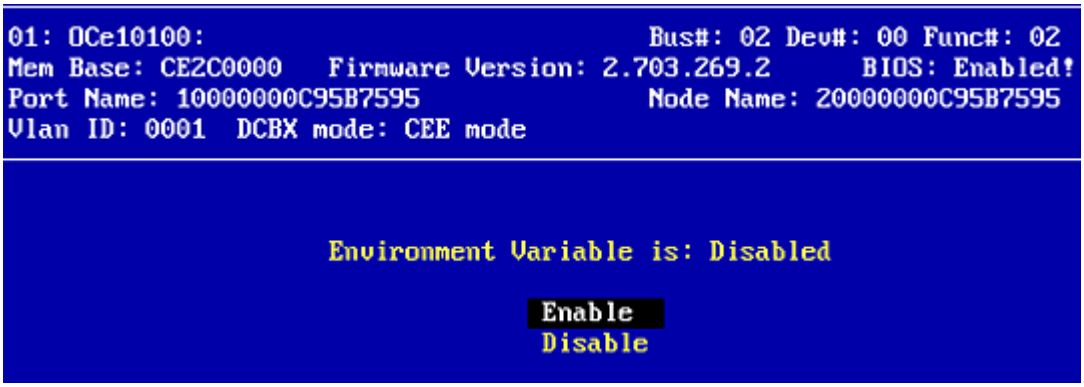

Figure 6-20 Enable or Disable Environment Variable Screen

3. Select whether to enable or disable the environment variable.
4. Press **<Enter>** to select the change.
5. Press **<Esc>** to return to the advanced adapter configuration menu.
6. For changes to take effect, reboot the system.

Enabling or Disabling Auto Boot Sector

This option automatically defines the boot sector of the target disk for the migration boot process, which applies only to HP MSA1000 arrays. If there is no partition on the target, the default boot sector format is 63 sectors. The default setting is disabled.

To enable or disable the auto boot sector format:

1. From the main configuration menu (Figure 6-2), select **Configure Advanced Adapter Parameters** and press **<Enter>**. The adapter configuration menu is displayed (Figure 6-13).
2. Select **Enable or Disable Auto Boot Sector** and press **<Enter>**. The Auto Boot Sector configuration screen is displayed.

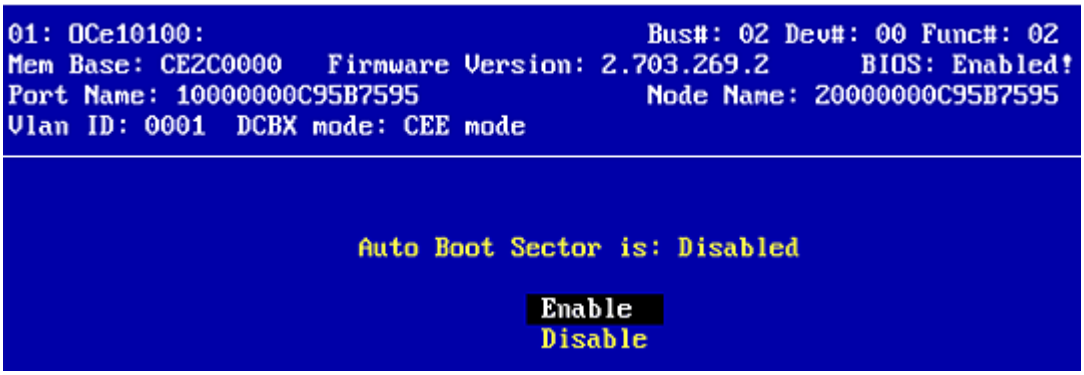
01: OCe10100: Bus#: 02 Dev#: 00 Func#: 02
Mem Base: CE2C0000 Firmware Version: 2.703.269.2 BIOS: Enabled!
Port Name: 10000000C95B7595 Node Name: 20000000C95B7595
Vlan ID: 0001 DCBX mode: CEE mode
Auto Boot Sector is: Disabled
Enable
Disable

Figure 6-21 Enable or Disable Auto Boot Sector Format Screen

3. Select whether to enable or disable the auto boot sector.
4. Press **<Enter>** to accept the new value.
5. Press **<Esc>** to return to the advanced adapter configuration menu.
6. For changes to take effect, reboot the system.

Using Multi-Path Boot from SAN

Multi-boot BIOS is in compliance with BBS. The system must have a Multi-boot system BIOS in order to take advantage of this option. The Multi-boot BIOS allows you to select any boot disk in the system BIOS setup menu. The boot disk can be an FC drive, a SCSI drive, an IDE drive, a USB device, or a floppy drive. The Emulex BIOS supplies the first eight drives to the system BIOS menu. The Multi-boot BIOS can override the FC drive that is selected in the BIOS utility.

For example, the system has eight FC disks only. The boot disk has AL_PA 02. However, you can select AL_PA 23 in the system BIOS setup menu. The boot device is the FC disk with AL_PA 23 instead of AL_PA 02, as is set in the BIOS utility.

If your system supports Multi-boot BBS, the local boot disk (drive C) is the first entry in Multi-boot on the system BIOS setup menu. The list of entries is determined by the list of configured boot entries in the BIOS utility. For example:

```
Adapter 1: boot_entry0, boot_entry1
Adapter 2: boot_entry2, boot_entry3
```

The order of boot entries exported to Multi-boot (BBS) is

```
boot_entry0, boot_entry1, boot_entry2, and boot_entry3.
```

However, Multi-boot allows changing the boot order in the server BIOS, which allows any disk to become the C drive.

Resetting to Default Values

The BIOS utility enables you to reset BIOS boot parameters to their factory default settings. These defaults are listed in Table 6-2.

Table 6-2 Default Adapter Boot Parameter Values

Parameter	Default Value	Valid Values
Boot from SAN	Disabled	Enabled Disabled
AL_PA Value	0x00 Fibre	See Table 6-1, Valid AL_PA Values.
EDD 3.0	Enabled (EDD 3.0)	Enabled (EDD 3.0) Disabled (EDD 2.1)
PLOGI Retry Timer	Disabled	Disabled 50 msec 100 msec 200 msec
Spinup Delay	Disabled	Enabled Disabled
Auto Scan	Disabled	Enabled Disabled
Start Unit	Disabled	Enabled Disabled
Environmental Variable	Disabled	Enabled Disabled
Auto Boot Sector	Disabled	Enabled Disabled

To reset parameters to their factory default settings:

1. On the main configuration menu (Figure 6-2) select **Reset Adapter Defaults** and press **<Enter>**. A screen is displayed that asks if you want to reset to the defaults.

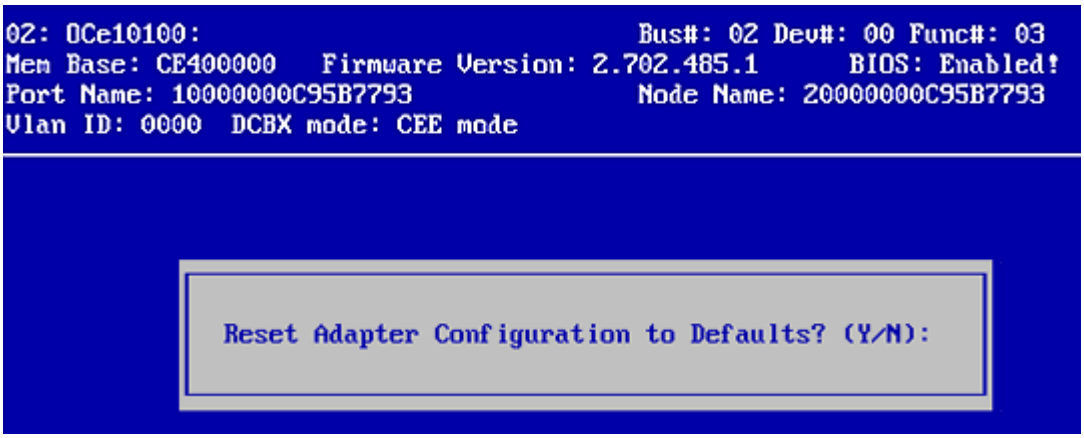

Figure 6-22 Reset Adapter Configuration to Defaults Screen

2. Press **<Y>**. All settings revert to their factory default values.
3. Press **<Esc>** to go to the previous menu.

7. Updating and Enabling Boot Code

Emulex provides utilities to update and enable boot code. The utility that you use depends on the operating system and, in some cases, the driver type or system architecture. Table 7-1 indicates the utilities that are currently available for each operating system.

Table 7-1 Utilities that Update and Enable Boot Code

Operating System	OneCommand Manager Application	OCM CLI	Offline Utilities	EFI Utilities	OCM for VMware vCenter
Windows	✓	✓	✓	✓	
Linux[1]	✓	✓	✓	✓	
VMware[2]	✓	✓			✓
Solaris	✓	✓			

1) For the Citrix operating systems, the OneCommand Manager application CLI is not supported locally, but can be managed using a remote system. The OneCommand Manager GUI application is not supported.

2) For VMware operating systems, the OneCommand Manager application GUI and CLI are not supported locally, but can be managed remotely using a Windows system.

After you decide which utility to use, see the appropriate documentation for the proper procedures:

- OneCommand Manager application: see the *OneCommand Manager Application User Manual*, the *OneCommand Manager Command Line Interface User Manual*, or the *OneCommand Manager for VMware vCenter User Manual*.
- OCM CLI: see the *OneCommand Manager Application CLI User Manual*.
- Offline utilities: see the *Offline and Online Adapter Management Utilities User Manual*.
- EFI utilities: see
  - chapter 11., "Configuring UEFI for Ethernet," on page 134
  - chapter 12., "Configuring UEFI for iSCSI," on page 172
  - chapter 13., "Configuring UEFI for FCoE," on page 202
- OCM for VMware vCenter: see the *OneCommand Manager for VMware vCenter User Manual*.

8. Configuring iSCSI Boot Support with the iSCSISelect Utility

This section provides quick installation instructions for setting up a basic boot configuration. For more information on setting up an iSCSI initiator and adding an iSCSI target, see chapter 9., "Configuring and Managing the iSCSI Initiator with the iSCSISelect Utility," on page 108 and chapter 10., "Configuring and Managing iSCSI Targets with the iSCSISelect Utility," on page 119.

Navigating the iSCSISelect Utility

Use the following methods to navigate the iSCSISelect utility:

- Press the up/down arrows on your keyboard to move through and select menu options or configuration fields. When multiple adapters are listed, use the up/down arrows to scroll to the additional adapters.
- Press **<Tab>** to move to the next field, and **<Shift> <Tab>** to move to the previous field.
- Press **<Enter>** to accept a selection, select a menu option, to select a row in a configuration screen, or to change a configuration default.
- Press **<Esc>** to return to the previous menu or page, cancel a selection or dialog box, or exit the utility.

Setting Up a Basic iSCSI Boot Configuration

By setting up a basic iSCSI boot configuration, you can configure your initiator, contact network devices, and set up an iSCSI boot target. With iSCSI boot capability, the iSCSISelect utility can quickly and easily provide the target LUN disk to the operating system through the BIOS. After setting up a basic iSCSI boot configuration, you can continue to use the iSCSISelect utility to manage your OneConnect Server iSCSI SAN environment.

When setting up a basic iSCSI boot configuration you must do the following:

- Configure the iSCSI initiator name and enable boot support
- Configure the network properties
- Add an iSCSI target and enable it as a boot target
- Set your boot LUN
- Reboot your system

To set up a basic iSCSI Boot configuration:

1. Log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
2. From the iSCSI Initiator Configuration menu, set the initiator name.

3. Select **Save** and press **<Enter>** to save your initiator name.

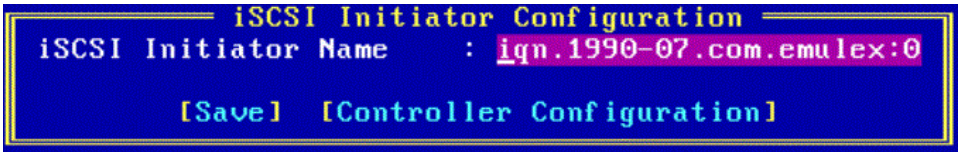

Figure 8-1 iSCSI Initiator Configuration Menu

4. Select **Controller Configuration** and press **<Enter>**. If you are running a single controller, the Controller Configuration menu is displayed (Figure 8-3). If you are running multiple controllers, the Controller Selection menu is displayed (Figure 8-2).

Controller Selection Menu
Controller #0 - Port #0: Bus 42 Dev 00
Controller #0 - Port #1: Bus 42 Dev 00
Controller #0 - Port #2: Bus 42 Dev 00
Controller #0 - Port #3: Bus 42 Dev 00

Figure 8-2 Controller Selection Menu

5. From the Controller Selection menu, select your controller and port then press **<Enter>**. For more information, see "Selecting a Controller" on page 109.
6. After you have selected your controller, the Controller Configuration menu appears.

Figure 8-3 Controller Configuration Menu

7. From this menu, select **Controller Properties** and press **<Enter>**. The Controller Properties screen appears. For more information on the Controller Properties screen, see "Viewing the Controller Properties" on page 110.

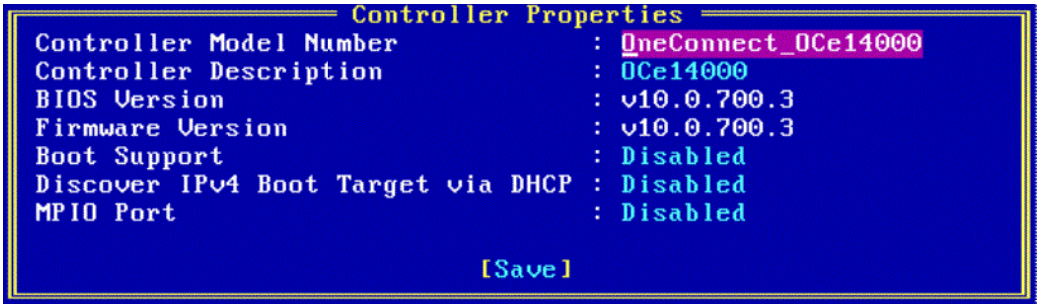
Controller Properties
Controller Model Number : OneConnect_OCe14000
Controller Description : OCe14000
BIOS Version : v10.0.700.3
Firmware Version : v10.0.700.3
Boot Support : Disabled
Discover IPv4 Boot Target via DHCP : Disabled
MPIO Port : Disabled
[Save]

Figure 8-4 Controller Properties Screen

8. Ensure Boot Support is set to Enabled.
9. Select **Save** and press **<Enter>**.

10. From the Controller Configuration menu, select **Network Configuration** and press **<Enter>**. The Network Configuration screen appears.

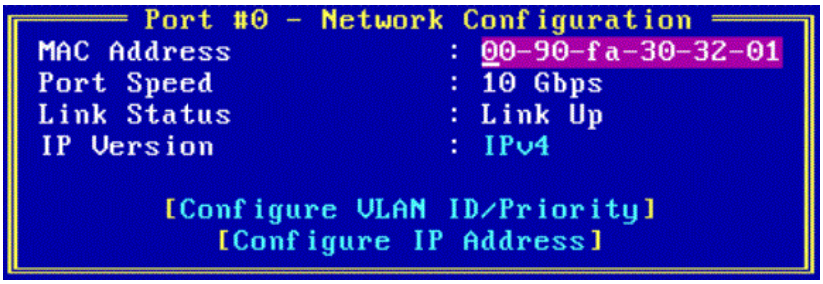
Port #0 - Network Configuration
MAC Address : 00-90-fa-30-32-01
Port Speed : 10 Gbps
Link Status : Link Up
IP Version : IPv4
[Configure VLAN ID/Priority]
[Configure IP Address]

Figure 8-5 Network Configuration Screen

11. Configure a network IP address. From the Network Configuration screen, you can do the following:
    - Select the IP version. You can choose IPv4 or IPv6. For more information, see "Selecting the IP Version" on page 113.
    - Set up an IP address. For more information, see "Configuring the IP Address" on page 114.
12. If desired, configure a VLAN ID. For more information, see "Configuring VLAN ID and VLAN Priority" on page 113.
13. After configuring the network, you can add a SCSI target. From the Controller Configuration menu, select **iSCSI Target Configuration**, then select **Add a New iSCSI Target**. For more information, see "Adding iSCSI Targets" on page 119.
14. After you have successfully configured the iSCSI initiator and target, reboot the system.

Booting the System

After you have successfully set up your basic boot configuration, exit the iSCSISelect utility and the system automatically reboots. During the next boot up, the iSCSI BIOS logs into the configured iSCSI boot target and display its target/LUN information in the BIOS sign-on banner. For example:

```
Controller#0 Port#0 Base 0xFCE60000 at Bus:01 Dev:00 Fun:02
Controller#0 Port#1 Base 0xFCEA0000 at Bus:01 Dev:00 Fun:03

<<< Press <Ctrl><S> for iSCSISelect(TM) Utility >>>

Initiator iSCSI Name:  iqn.2004-05.com.emulex
Initiator IP Address:  172. 40.  1.41
Initiator IP Address:  172. 40.  1.62

Drive #0 NETAPP   LUN 0  2048 MB
Drive Geometry    105    3FFF
BIOS Installed Successfully!
```

9. Configuring and Managing the iSCSI Initiator with the iSCSISelect Utility

The iSCSI initiator or host (also known as the iSCSI client) is a system such as a server, which attaches to an IP network and initiates requests and receives responses from an iSCSI target. Each iSCSI host is identified by a unique IQN.

Once you have an initiator host system running, you must configure the initiator to allow access to the iSCSI SAN. To do this, you must:

1. Configure the iSCSI initiator name.
2. Select a controller. For additional information, see "Selecting a Controller" on page 109.
3. Configure network properties. For additional information, see "Configuring Network Properties" on page 112.

Configuring the iSCSI Initiator Name

The iSCSI initiator name is a unique identifier for the initiator on the network and configures target access. It must be unique to that system on the network and is identified by an IQN. The iSCSI initiator name is global to the entire system. The iSCSI initiator name must also match the target's ACL. After you log into the iSCSISelect utility, you can configure the iSCSI initiator name from the iSCSI Initiator Configuration screen.

Note: When installing Microsoft software iSCSI initiator service, the iSCSI initiator name for OneConnect will change and any IQN name previously configured through the iSCSISelect utility will be overridden. Though this will not affect existing boot sessions and persistent sessions, new target logins may fail because the new IQN name may not match the incoming initiator IQN names configured on the target. To avoid this situation, after installing Microsoft software, you must rename the IQN name to the previous IQN name you had configured.

To configure the iSCSI initiator name:

1. Log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted. After the BIOS initializes, the iSCSI Initiator Configuration screen appears.
2. Set or change the iSCSI initiator name from this screen.

Figure 9-1 iSCSI Initiator Configuration Screen

Note: If there are multiple controllers in your system, your iSCSI Initiator name may be different for each controller. If this happens, an error message indicates an Initiator iSCSI Name mismatch. You must save a new initiator

name on this menu so that the iSCSI Initiator Name on all the controllers match. If there were pre-existing sessions before the iSCSI Initiator Name change, the pre-existing sessions use the original name that was used to login the very first time. The new name is used for any sessions added after the name change.

3. Select **Save** and press **<Enter>** to save the iSCSI initiator name. If you select **Controller Configuration** without saving the changes, a warning message will appear stating that your settings will be lost and asking whether you want to cancel or not. Press **<Y>** and you will lose your changes. Press **<N>** and you will return to the iSCSI Initiator Configuration screen.

Selecting a Controller

After you configure an ISCSI initiator name, select a controller to configure the iSCSI target. If you are running the iSCSISelect utility with multiple controllers, all the controllers are listed in the Controller Selection menu. Figure 9-2 is an example of the Controller Selection menu.

Controller Selection Menu
Controller #0 - Port #0: Bus 42 Dev 00
Controller #0 - Port #1: Bus 42 Dev 00
Controller #0 - Port #2: Bus 42 Dev 00
Controller #0 - Port #3: Bus 42 Dev 00

Figure 9-2 Controller Selection Menu

After you select the controller, the Controller Configuration menu appears. From this menu, you can configure and manage the iSCSI initiator and targets.

Figure 9-3 Controller Configuration Menu

If you are not sure that you are configuring the correct port, you can check by either:

- Performing port identification. For additional information, see “Identifying a Port” on page 118.
- Checking the link status in the Network Configuration menu. Connect the controller port to a 10 Gb/s switch port and check the link status in the Network Configuration menu. If the status is Link Up, it is the correct controller port.

  Note: Make sure you back out of the Network Configuration menu to the Controller Configuration menu before checking the Network Configuration menu. This allows the Link Status field to refresh when you insert or remove the cable from the controller.

Viewing the Controller Properties

The Controller Properties screen displays controller information and allows you to configure controller options, such as boot support, IPv4 boot target discovery using DHCP, and MPIO port configuration.

To view the controller properties:

1. From the Controller Configuration menu (Figure 9-3), select **Controller Properties** and press **<Enter>**. The Controller Properties screen is displayed.

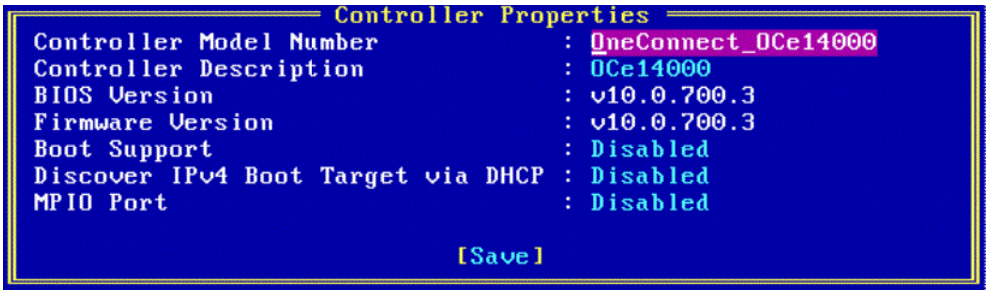
Controller Properties
Controller Model Number : OneConnect_OCe14000
Controller Description : OCe14000
BIOS Version : v10.0.700.3
Firmware Version : v10.0.700.3
Boot Support : Disabled
Discover IPv4 Boot Target via DHCP : Disabled
MPIO Port : Disabled
[Save]

Figure 9-4 Controller Properties Screen

Enabling Boot Support

Boot support is provided for each port or function. If boot support is enabled, you can boot from the specified function. If boot support is disabled, you will not be able to boot from the function.

To enable boot support:

1. From the Controller Properties screen (Figure 9-4), select **Boot Support** and press **<Enter>**. A pop-up menu appears.

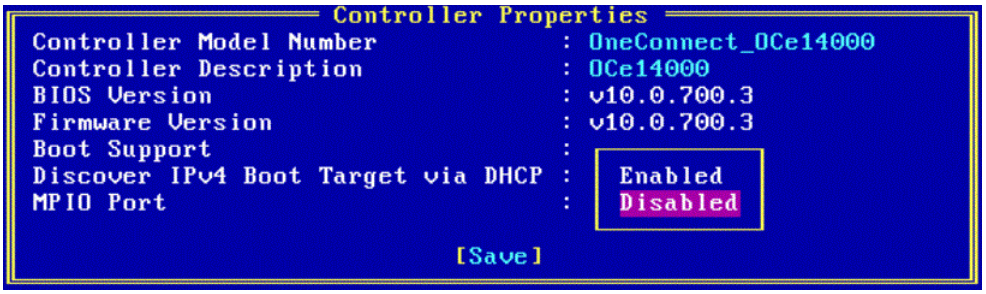

Figure 9-5 Controller Properties Screen with Boot Support Pop-up Menu

2. Select **Enabled** or **Disabled** and press **<Enter>**.
3. To save your changes, select **Save** and press **<Enter>**.

Enabling IPv4 Boot Target Discovery using DHCP

To enable IPv4 boot target discovery using DHCP:

1. From the Controller Properties screen (Figure 9-4), select **Discover IPv4 Boot Target via DHCP** and press **<Enter>**. A pop-up menu appears.

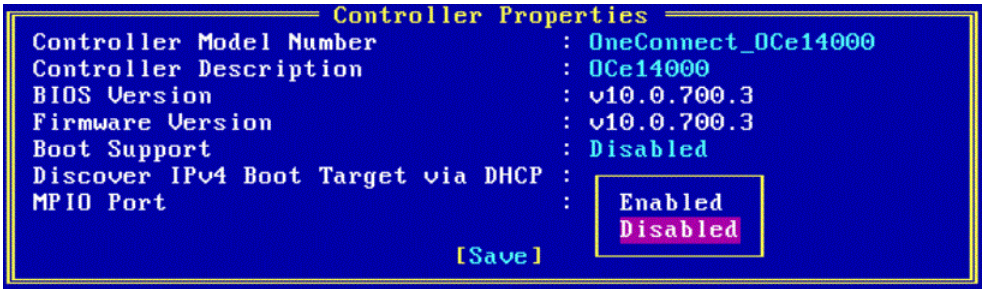

Figure 9-6 Controller Properties Screen with Discover IPv4 Boot Target via DHCP Pop-up Menu

2. Select **Enabled** or **Disabled** and press **<Enter>**.
3. To save your changes, select **Save** and press **<Enter>**.

Enabling the MPIO Port

MPIO support allows the initiator to log in dual sessions to the same target. In this way I/O can be sent over either TCP/IP connection to the target. If one session fails another session can continue processing I/O without interruption to the application. In iSCSI target configuration, you have the option of setting dual network paths to a single boot LUN.

Note: Although MPIO boot support allows the initiator to log into multiple sessions, the iSCSI BIOS currently limits the number of sessions to two iSCSI sessions for a single boot LUN.

You must follow these steps in this order to configure MPIO boot support for each operating system.

1. Use the Emulex iSCSI configuration utility to configure the first path to a boot target.
2. Complete normal operating system installation.
3. Install third-party MPIO software for your operating system.
4. Configure the second path to a single boot LUN through the Emulex iSCSI configuration utility.

To enable MPIO support:

1. From the Controller Properties screen (Figure 9-4), select **MPIO Port** and press **<Enter>**. A pop-up menu appears.

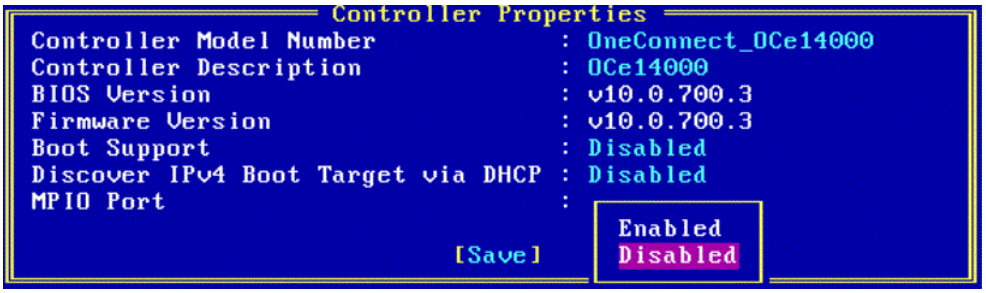

Figure 9-7 Controller Properties Screen with MPIO Port Pop-up Menu

2. Select **Enabled** or **Disabled** and press **<Enter>**.
3. To save your changes, select **Save** and press **<Enter>**.

Configuring Network Properties

The Network Configuration screen displays the MAC address, port speed, and link status for the adapter. From the Network Configuration screen, you can configure the following items:

- IP version
- VLAN ID/priority
- IPv4 or IPv6 address

To view the network configuration:

1. From the Controller Configuration menu (Figure 9-3), select **Network Configuration** and press **<Enter>**. The Network Configuration screen is displayed.

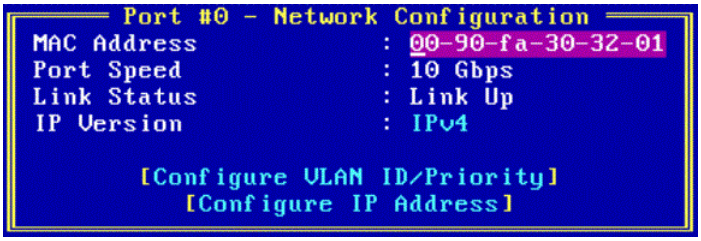
Port #0 - Network Configuration
MAC Address : 00-90-fa-30-32-01
Port Speed : 10 Gbps
Link Status : Link Up
IP Version : IPv4
[Configure VLAN ID/Priority]
[Configure IP Address]

Figure 9-8 Network Configuration Screen

Selecting the IP Version

To select the IP version:

1. From the Network Configuration screen (Figure 9-8), select **IP Version** and press **<Enter>**. A pop-up menu appears.

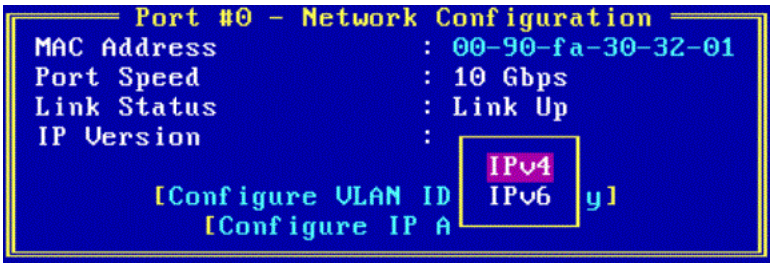

Figure 9-9 Network Configuration Screen with IP Version Pop-up Menu

2. Select **IPv4** or **IPv6** and press **<Enter>**.

Configuring VLAN ID and VLAN Priority

A Virtual Local Area Network (VLAN) is a way of partitioning the network. If the LAN is made up of all devices within a broadcast domain, a VLAN is a broadcast domain made up of switches. You first create a VLAN and then assign ports to a VLAN. All ports in a single VLAN are in a single broadcast domain.

You do not have to configure VLANs unless your network is already using them. Some reasons why VLANs are used include:

- A LAN increases in size with several devices.
- A LAN has increased broadcast traffic on it.
- Groups of users on a LAN need more security.

A VLAN ID, like an IP address or initiator name, is assigned a value to uniquely identify it on a network. A VLAN priority is set to determine what packet gets priority order within a VLAN.

To configure a VLAN ID and VLAN priority:

1. On the Network Configuration screen (Figure 9-8), select **Configure VLAN ID/Priority** and press **<Enter>**. The Configure VLAN ID/Priority screen appears.

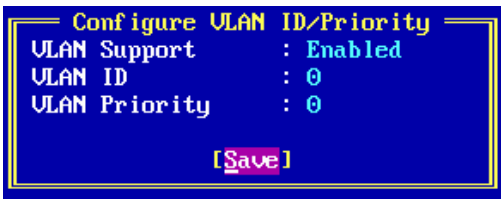

Figure 9-10 Configure VLAN ID/Priority Screen

2. Select the VLAN Support pop-up menu and select **Enabled**.
3. Set a VLAN ID number. This is a unique value you assign to each VLAN on a single device. There are a maximum of 4095 possible values ranging from 0-4094.

4. Set a VLAN Priority, if necessary. This unique value assigns a priority to outbound packets containing a specified VLAN ID. Valid values range from 0 -7, with 0 the highest priority level.
5. Select **Save** and press **<Enter>**.
6. Press **<Esc>** to return to the Network Configuration screen.

Configuring the IP Address

The IP address is a logical address for the controller and uniquely identifies the system on a TCP/IP network. Depending on the IP version that you selected, you can either configure an IPv4 address or an IPv6 address.

Configuring the IPv4 Address

The IP address can be determined statically (manually assigned) or dynamically (with the DHCP server to obtain an IP address). The method that you choose depends on your network configuration. If your network uses a DHCP configuration, then you can enable DHCP and obtain an IP address from the DHCP server. If a DHCP server is not available, you must configure a static IP address.

Note: For all Linux-based operating systems, Emulex recommends that you enable DHCP when attempting to assign an IP address to an iSCSI port. This should be done as the iSCSI firmware will not detect it as a duplicate IP address if one already exists on a Linux server. Otherwise, you must manually ensure there are no duplicate IP addresses before assigning an IP address.

Note: If you are using target discovery through DHCP, you must add the root path to the DHCP server and enable DHCP discovery through the iSCSISelect utility.

To configure an IPv4 address:

1. On the Network Configuration screen (Figure 9-8), ensure that the IP Version is set to IPv4.
2. Select **Configure IP Address** and press **<Enter>**. The Configure IPv4 Address screen appears.

Figure 9-11 Configure IPv4 Address Screen

3. From the Configure IPV4 Address screen, you can do the following:
   - Enable DHCP for automatic assignment of the IP address through a DHCP server. See “Enabling DHCP” on page 115 for more information.
   - Configure a static IP address (when DHCP is disabled). See “Configuring a Static IPv4 Address” on page 116 for more information.

- Ping the iSCSI initiator. See “Pinging the iSCSI Initiator” on page 117 for more information.

Enabling DHCP

Enabling DHCP provides the initiator with an IP address.

Note: If you are using the DHCP server to obtain an IP address for your iSCSI initiator, set up a reservation. A reservation assigns a specific IP address based on the MAC address of your iSCSI function. If you do not reserve an IP address through DHCP, then you must set the lease length for the iSCSI initiator IP address to unlimited. This prevents the IP address lease from expiring.

To enable DHCP:

1. From the Configure IPV4 Address screen (Figure 9-11), select **Enabled** from the DHCP pop-up menu and press **<Enter>**.
2. Select **Save DHCP Settings** and press **<Enter>**. The DHCP IP Address dialog box appears. For example:

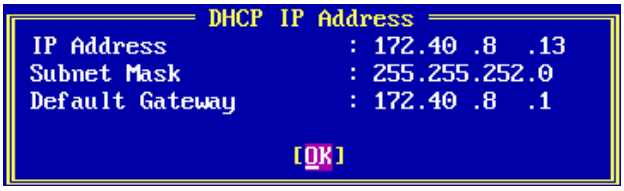

Figure 9-12 DHCP IP Address Dialog Box

Note: If you have set a static IP address, a message warns that the static IP address will be lost. Press **<Y>** to continue with enabling DHCP.

Configuring the IPv6 Address

To configure an IPv6 address:

1. On the Network Configuration screen (Figure 9-8), ensure that the IP Version is set to IPv6.
2. Select **Configure IP Address** and press **<Enter>**. The Configure IPv6 Address screen appears.

Figure 9-13 Configure IPv6 Address Screen

3. From the Configure IPV6 Address screen, you can do the following:
   - Enable auto-configuration for automatic assignment of the IP address. See “Enabling DHCP” on page 115 for more information.
   - Configure a static IP address (when Auto Configuration is disabled). See “Configuring a Static IPv6 Address” on page 117 for more information.

- Ping the iSCSI initiator. See "Pinging the iSCSI Initiator" on page 117 for more information.

Enabling Auto Configuration

To automatically configure the IPv6 address, from the Configure IPV6 Address screen (Figure 9-13), select **Enabled** from the Auto Configuration pop-up menu and press **<Enter>**.

Configuring a Static IPv4 Address

If a DHCP server is not available, you must manually configure a static IPv4 address.

To configure a static IP address:

1. From the Configure IPV4 Address screen (Figure 9-11), select **Configure Static IP Address** and press **<Enter>**.

   Note: If you have DHCP enabled, a message warns that the DHCP IP Address will be lost. Press **<Y>** to continue to configure a static IP address.

   The Static IP Address dialog box is displayed.

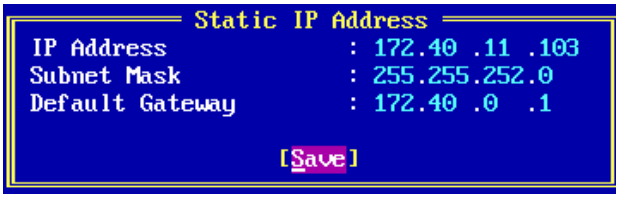

Figure 9-14 Static IP Address Dialog Box for IPv4

2. Enter the IP address. This is a unique 32-bit address that specifies the location of each device or workstation in the network. This address is required for communication to the iSCSI SAN. For an initiator with its own network interface, you must assign an IP address in the same range as the iSCSI SAN.
3. Enter the subnet mask. The subnet mask provides a way to segment networks. All hosts (iSCSI initiators or targets) on the same physical network usually have the same subnet mask. For example, Figure 9-14 shows the initiator in the subnet 255.255.xxx.xxx. All the hosts (initiators or targets) in a sub-network will have the same subnet mask.
4. Enter the default gateway information, if necessary. A gateway is a router on a computer network that serves as an access point to another network and that an initiator uses by default. Any data to addresses not on the initiator's subnet are sent through the default gateway.
5. Select **Save** and press **<Enter>** to save the settings.
6. You are prompted to save the changes, type **<Y>**.
7. Press **<Esc>** to return to the Network Configuration screen.

Configuring a Static IPv6 Address

If Auto Configuration is disabled, you must manually configure a static IPv6 address.

To configure a static IP address:

1. From the Configure IPV6 Address screen (Figure 9-13), select **Configure Static IP Address** and press **<Enter>**.

   The Static IP Address dialog box is displayed.

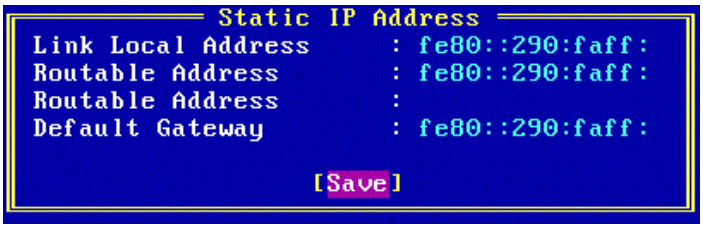

Figure 9-15 Static IP Address Dialog Box for IPv6

2. Enter the link local address, two routable addresses, and default gateway address in the corresponding fields.
3. Select **Save** and press **<Enter>** to save the settings.
4. You are prompted to save the changes, type **<Y>**.
5. Press **<Esc>** to return to the Network Configuration screen.

Pinging the iSCSI Initiator

After you configure the IPv4 or IPv6 address, you can confirm your network settings by pinging the network. The ping option checks whether the IP address is on the network. If there is another IP entity on that network when you ping, you receive a ping reply back to confirm the network settings. Ping can be a diagnostic tool but it is also a validation that your network is set up properly prior to target login.

To verify that a target is accessible and that you are connected to the network:

1. From the Configure IPV4 Address screen (Figure 9-11) or Configure IPV6 Address screen (Figure 9-13), select **Ping** and press **<Enter>**.
2. In the Ping Target dialog box, enter the IP address of the iSCSI device you want to ping. You are notified that the ping is successful. If the ping is unsuccessful, you will receive a failed message. For more information, see "Troubleshooting for the iSCSI Protocol" on page 224. Figure 9-16 is an example of a successful ping.

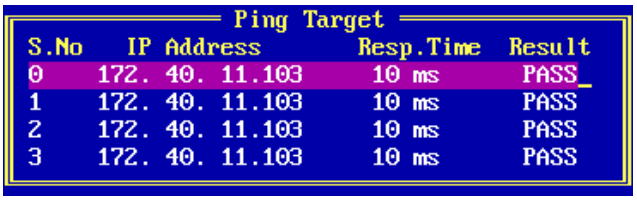
Ping Target
S.No IP Address Resp.Time Result
0 172. 40. 11.103 10 ms PASS
1 172. 40. 11.103 10 ms PASS
2 172. 40. 11.103 10 ms PASS
3 172. 40. 11.103 10 ms PASS

Figure 9-16 Successful Ping Screen

Note: The ping works for any IP address that supports ICMP (Echo).

If you cannot verify the network interface, there may be a number of reasons why. For more information, see "Troubleshooting for the iSCSI Protocol" on page 224.

Identifying a Port

Port identification, or beaconing, helps you physically determine which port you are configuring by blinking both the link and the activity LEDS of that port.

LEDs blink on the back of the server so that there is no confusion as to which physical port you are configuring with the iSCSISelect utility. Port identification allows you to correlate the iSCSI software configuration with the hardware port.

Note: Not all controllers have LEDs that are externally visible. If you are using an add-in card in a blade server environment, the port identification or beaconing capability does not work.

To identify a port, from the Controller Configuration menu, select **Port Identification** and press **<Enter>**. The LED status indicators for the selected port blink on the controller until you select **Done** and press **<Enter>** on the Port Identification screen.

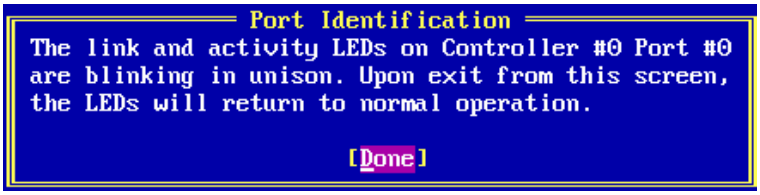
Port Identification
The link and activity LEDs on Controller #0 Port #0
are blinking in unison. Upon exit from this screen,
the LEDs will return to normal operation.
[Done]

Figure 9-17 Port Identification Screen

Erasing the Current Configuration

Erase Configuration erases the configuration of a single controller. Configuration data is erased for both ports on the selected controller. The initiator name is global for all OneConnect controllers in the system. If you have more than one controller and you erase the configuration on the first controller, the Erase Configuration option resets the initiator name back to their default values. If you erase the configuration on the second controller, the default values are only reset for the second controller and are not reset globally on both controllers.

Note: You must select **Erase Configuration** to clear out existing IQN data if you purchase a different or subsequent license for the adapter.

To erase a controller configuration:

1. From the Controller Configuration menu, select **Erase Configuration** and press **<Enter>**.
2. A message appears asking if you want to erase the current configuration. Type **<Y>**.
3. You are cautioned that the operation removes any existing configuration permanently. Type **<Y>**.

   When the controller configuration is erased, the Controller Configuration menu is displayed.

10. Configuring and Managing iSCSI Targets with the iSCSISelect Utility

An iSCSI target is any device that receives iSCSI commands. The device can be an end node, such as a storage device, or it can be an intermediate device, such as a bridge between IP and FC devices. Each iSCSI target is identified by a unique IQN, and each port on the controller (or on a bridge) is identified by one or more IP addresses.

As the client system, the initiator initiates disk I/O. It communicates with the target and the target serves the initiator by providing resources to the initiator.

Once you configure your iSCSI initiator and verified that your network interface is working, you can log into your target to establish your connection. To do this, you must:

- Perform a login to the target (adding a target).
- Ping a target and verify that you can connect to it.
- Reboot the system.

Adding iSCSI Targets

Once the initiator has been configured you need a process that shows you how to make an iSCSI target available to that initiator host. The discovery process presents an initiator with a list of available targets. The discovery methods used for discovering targets are:

- SendTargets discovery
- Manually configuring targets

With the iSCSISelect utility, you can easily configure an iSCSI target by selecting and enabling values on the Add/Ping iSCSI Target menu. From this menu, you can configure the target and perform a login to the target to establish an iSCSI network connection.

Before you begin the login session, gather the following information:

- iSCSI target name (only for manual configuration) – The target name that you are adding. The iSCSI target name is not required if you are using SendTargets discovery. It is required only for manually configured targets. This name should be known to you based on how you configured your iSCSI target. For more information, see "Using SendTargets Discovery to Add an iSCSI Target" on page 120.
- iSCSI target IP address – The IP address of the target into which you are logging.
- TCP port number – The TCP port number of the target portal. Typically this is 3260, which is the well-known port number defined for use by iSCSI.

Using SendTargets Discovery to Add an iSCSI Target

SendTargets discovery asks an iSCSI target to provide the list of target names that can be logged into by the initiator. The iSCSI initiator then uses the SendTargets Discovery option to perform the device discovery. Use this method if an iSCSI node has a large number of targets. When adding an iSCSI target, leave the iSCSI target name option blank, you can use the iSCSI SendTargets mechanism to add a target.

To configure an iSCSI target using the SendTargets discovery:

1. Log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
2. Select **Controller Configuration** and press **<Enter>**. A list of controllers is displayed.
3. Select a controller and press **<Enter>**. The Controller Configuration menu is displayed.

Figure 10-1 Controller Configuration Menu

4. From the Controller Configuration menu, select **iSCSI Target Configuration** and press **<Enter>**.
5. Select **Add New iSCSI Target** and press **<Enter>**.
6. In the Add/Ping iSCSI Target dialog box, leave the iSCSI Target Name blank for a SendTargets response.

   Note: Only the first 64 sessions are returned during a single discovery session.

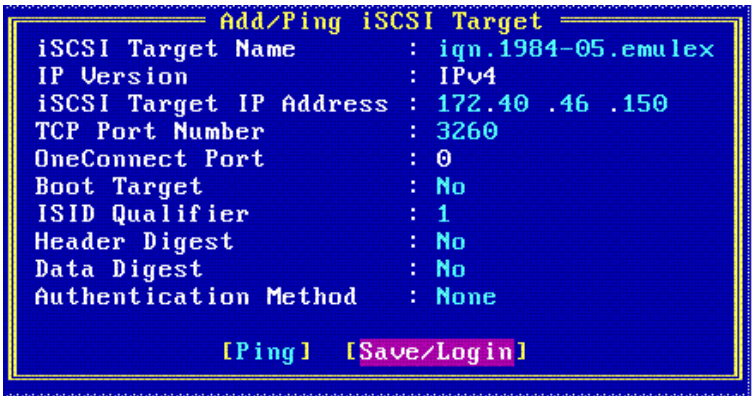
Add/Ping iSCSI Target
iSCSI Target Name : iqn.1984-05.emulex
IP Version : IPv4
iSCSI Target IP Address : 172.40 .46 .150
TCP Port Number : 3260
OneConnect Port : 0
Boot Target : No
ISID Qualifier : 1
Header Digest : No
Data Digest : No
Authentication Method : None
[Ping] [Save/Login]

Figure 10-2 Add/Ping iSCSI Target dialog box

7. Enter the iSCSI target IP address.
8. Change the TCP port number value, if necessary. The default target port number is 3260.
9. For a boot target, accept the default (No), even if you want to enable the target as a boot target. For more information about the boot target, see "Setting Up a Basic

iSCSI Boot Configuration" on page 105.

Note: You must enable the Boot Target option after you add the target via SendTargets (see step 16).

10. Change the ISID qualifier value, if necessary. A unique ISID value is necessary if you connect dual sessions to the same target portal group. Enter a number up to 65535. For more information, see "Setting an ISID Value" on page 125.
11. Select **Yes** from the Header Digest pop-up menu if you want to enable header digest. When set to Yes, and the iSCSI initiator is set accordingly, the integrity of an iSCSI PDU's header segment is protected by CRC32C checksum. The default setting is No.
12. Select **Yes** from the Data Digest pop-up menu if you want to enable Data Digest. When set to Yes, and the iSCSI initiator is set accordingly, the integrity of an iSCSI PDU's data segment is protected by CRC32C checksum. The default setting is No.
13. Select an authentication method (optional). If you are enabling an authentication method, you are prompted to enter CHAP configuration. For more information, see "Enabling CHAP Authentication" on page 125.
14. Select **Save/Login**. A message reminds you that you have left the iSCSI Target name blank and that the SendTargets mechanism will be used. If you want to continue, press **<Y>**.
15. If the firmware successfully logs into the target, the Targets Discovered Via SendTargets screen appears. An unsuccessful login produces a failure message. After you send your SendTargets request to the target, the Targets Discovered Via SendTargets screen appears with a list of targets. From this list of targets specify which targets to add.

    To do this, select the target or targets you want to add from the menu and press **<F3>**. After you have selected your targets, you can add these targets to the list of iSCSI targets available for the initiator to login. To do this, select **Add Selected iSCSI Targets** and press **<Enter>** (Figure 10-3). If you enabled CHAP Authentication, you are prompted to enter CHAP configuration for each target, one at a time.For more information, see "Enabling CHAP Authentication" on page 125.

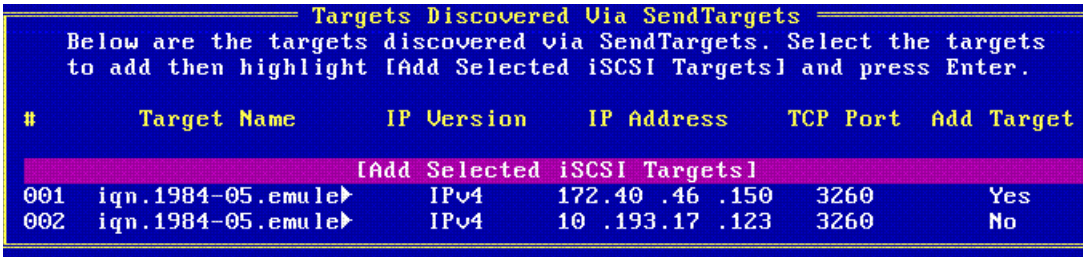
Targets Discovered Via SendTargets
Below are the targets discovered via SendTargets. Select the targets to add then highlight [Add Selected iSCSI Targets] and press Enter.
Target Name IP Version IP Address TCP Port Add Target
[Add Selected iSCSI Targets]
001 iqn.1984-05.emule IPv4 172.40 .46 .150 3260 Yes
002 iqn.1984-05.emule IPv4 10 .193.17 .123 3260 No

Figure 10-3 Targets Discovered via SendTargets Screen

16. After you have added your targets, from the Controller Configuration menu, select **iSCSI Target Configuration** and press **<Enter>** to view the added target information.

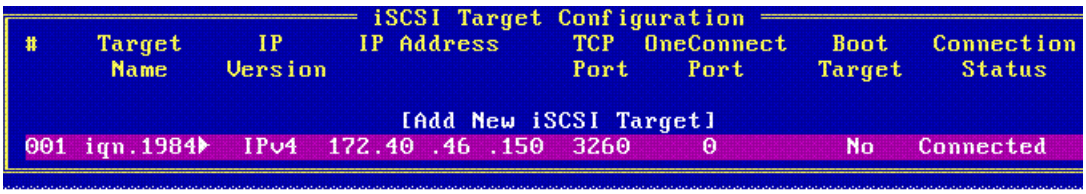

Figure 10-4 iSCSI Target Configuration Screen

Note: If you set the Boot Target option in step 5 before adding the target, the Boot Target displays No on this menu. To enable Boot Target, go to step 17.

17. To enable Boot Target or make any other changes to your target or targets, select the target and press **<Enter>**. The Edit/Ping iSCSI Target menu is displayed. From this menu, you can edit your target.

Manually Adding an iSCSI Target

Use this method if an iSCSI node has a small number of targets, or you want to restrict the targets that an initiator can access. To manually configure a target, you must provide the iSCSI target name.

To configure an iSCSI target manually:

1. Log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
2. Select **Controller Configuration** and press **<Enter>**. A list of controllers is displayed.
3. Select a controller and press **<Enter>**. The Controller Configuration menu is displayed.
4. From the Controller Configuration menu, select **iSCSI Target Configuration** and press **<Enter>**.
5. Select **Add New iSCSI Target** and press **<Enter>**. The Add/Ping iSCSI Target dialog-box is displayed (Figure 10-2).
6. Enter the iSCSI target name.
7. Enter the iSCSI target IP address.
8. Enter the TCP port number (the default target port number is 3260).
9. If you want to enable the target as a boot target, select **Yes**.
10. Enter an ISID Qualifier if needed. A unique ISID value is needed if you are connecting dual sessions to the same target portal group. You can enter a number up to 65535. For more information, see “Setting an ISID Value” on page 125.
11. Select **Yes** from the Header Digest pop-up menu if you want to enable Header Digest. When set to Yes, and the iSCSI initiator is set accordingly, the integrity of an iSCSI PDU’s header segment is protected by CRC32C checksum. The default setting is No.

12. Select **Yes** from the Data Digest pop-up menu if you want to enable Data Digest. When set to Yes, and the iSCSI initiator is set accordingly, the integrity of an iSCSI PDU's data segment is protected by CRC32C checksum. The default setting is No.
13. Select the Authentication Method. For more information, see "Enabling CHAP Authentication" on page 125.
14. Select **Save/Login** and press **<Enter>**. If the firmware logs into the target successfully, you receive a successful login message. Press **<Esc>** to go to the iSCSI Target Configuration menu where you can view information about the added target.
15. To enable Boot Target or make any other changes to your target or targets, select the target and press **<Esc>**.

Managing an iSCSI Target

With the iSCSISelect utility you can manage a target by viewing target details or by editing the target configuration.

Viewing Target Information

After you have successfully logged into the target, you can view the details of the newly-added target or manage the target. From the Controller Configuration menu, select **iSCSI Target Configuration** and press **<Enter>** to view the target information.

Note: The iSCSISelect utility only shows LUN information for the first 128 LUNs.

The following is an example of a target detail.

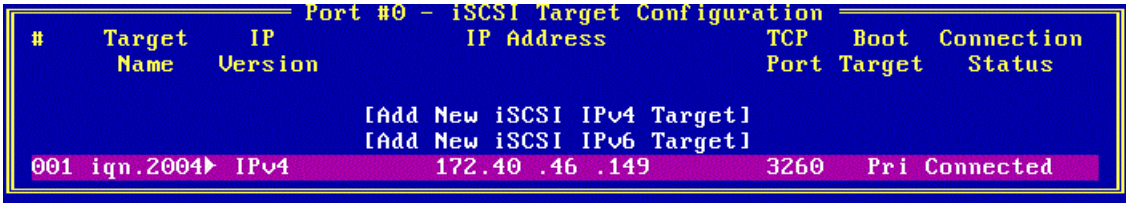

Figure 10-5 iSCSI Target Configuration Information

In the iSCSI Target Configuration menu, the functions keys located at the bottom of the menu help you manage your target configuration.

- Press **<Enter>** to select the target configuration.
- Press **<Del>** to delete the target.
- Press **<F5>** to log in to the target.
- Press **<F6>** to log out of the target.
- Press **<F7>** to configure the LUN.
- Press **<Esc>** to return to the previous menu.

Editing a Target Configuration

Once you have added a target, you can edit your iSCSI target configuration or apply other management options to the target.

Note: If you want to change the target name, you must delete the existing target and add it again with the new target name.

To edit a target configuration:

1. From the iSCSI Target Configuration dialog box, select the target and press **<Enter>**. The Edit/Ping iSCSI Target dialog box is displayed.

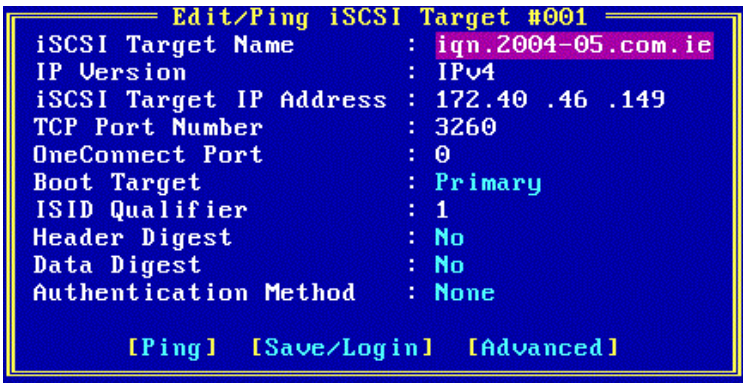
Edit/Ping iSCSI Target #001
iSCSI Target Name : iqn.2004-05.com.ie
IP Version : IPv4
iSCSI Target IP Address : 172.40 .46 .149
TCP Port Number : 3260
OneConnect Port : 0
Boot Target : Primary
ISID Qualifier : 1
Header Digest : No
Data Digest : No
Authentication Method : None
[Ping] [Save/Login] [Advanced]

Figure 10-6 Edit/Ping iSCSI Target Dialog Box

2. If you want to enable the target as a boot target, select **Boot Target** and select either **Primary** or **Secondary** in the Boot Target pop-up menu.
3. You can set the ISID Qualifier on the Edit/Ping iSCSI Target dialog box by selecting **ISID Qualifier** and typing a number value up to 65535. A unique ISID value is required if you are connecting dual sessions to the same target portal group. For additional information, see "Setting an ISID Value" on page 125.
4. To enable the Header Digest, select **Yes** in the Header Digest pop-up menu. When set to Yes, and the iSCSI initiator is set accordingly, the integrity of an iSCSI PDU's header segment is protected by CRC32C checksum. The default setting is No.
5. To enable the Data Digest, select **Yes** in the Data Digest pop-up menu. When set to Yes, and the iSCSI initiator is set accordingly, the integrity of an iSCSI PDU's data segment is protected by CRC32C checksum. The default setting is No.
6. To select an authentication method to use when logging into the target, select an authentication method from the Authentication Method pop-up menu. For more information about authentication methods, see "Enabling CHAP Authentication" on page 125.
7. To verify your target connection, select **Ping** and press **<Enter>**. For more information about ping, see "Adding iSCSI Targets" on page 119.
8. To view more target properties, select **Advanced** and press **<Enter>**. For more information on these properties, see "Viewing Advanced Target Properties" on page 128.
9. To save your changes, select **Save/Login** and press **<Enter>**.

The iSCSI Target Configuration appears with the revised information.

Setting an ISID Value

The ISID qualifier is a unique ISID value to specify if you are connecting dual sessions to the same target portal group. This value ensures that you do not log into the same session twice. A combination of the initiator name, ISID qualifier, target name, and target portal group defines an iSCSI session. For the ISID qualifier, you can enter a number up to 65535.

To set the ISID Qualifier:

1. Log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
2. Select **Controller Configuration** and press **<Enter>**. A list of controllers is displayed.
3. Select a controller and press **<Enter>**. The Controller Configuration menu is displayed.
4. From the Controller Configuration menu, select **iSCSI Target Configuration** and press **<Enter>**.
5. Select **Add New iSCSI Target** and press **<Enter>**.
6. From the Add/Ping iSCSI Target dialog box, select **ISID Qualifier** and type in a numeric value.
7. To save your changes, select **Save/Login** and press **<Enter>**.

   The iSCSI Target Configuration appears with the revised information.

For more information on when an ISID value must be changed, see "Booting from SAN for iSCSI MPIO" on page 83.

Enabling CHAP Authentication

The iSCSISelect utility uses CHAP to authenticate initiators and targets for added network security. By using a challenge/response security mechanism, CHAP periodically verifies the initiator's identity. This authentication method depends on a secret known only to the initiator and the target. Although the authentication can be one-way, you can negotiate CHAP in both directions with the help of the same secret set for mutual authentication. You must make sure however, that what you configure on the target side, matches the initiator side. The iSCSISelect utility supports both one-way and mutual authentication.

Authenticating One-Way CHAP

With one-way CHAP authentication, the target authenticates the initiator. Use one-way CHAP authentication for a one-way challenge/response security method.

To enable one-way CHAP authentication:

1. Log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
2. Select **Controller Configuration**. A list of controllers is displayed.
3. Select a controller and press **<Enter>**. The Controller Configuration menu is displayed.

4. From the Controller Configuration menu, select **iSCSI Target Configuration** and press **<Enter>**.
5. Select **Add New iSCSI Target** and press **<Enter>**.
6. Follow steps 5–11 in the procedure "Using SendTargets Discovery to Add an iSCSI Target" on page 120.
7. In the Add/Ping iSCSI Target dialog box, select **Authentication Method**, select **One-Way Chap**, and press **<Enter>**.

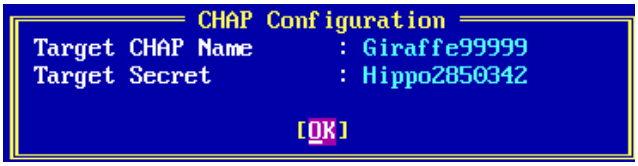

Figure 10-7 One-way Chap Configuration Dialog Box

8. Enter the target CHAP name and target secret, then select **OK** and press **<Enter>**.

   The target CHAP name can be any name or sequence of numbers over 12 and less than 16 characters. However, the name and secret on the target side must match the name and target on the initiator side.

   The target secret can be in string (for example, abcdefg23456) or hexadecimal (for example, 0x0123456789012345678 9ABCD) format.

   - If using a string format, the secret can be any name or sequence of numbers over 12 and less than 16 bytes long, where each character equals one byte.
   - If using a hexadecimal format, the secret must be at least 12 and less than 16 bytes long, where two characters equal one byte. Hexadecimal formatting restrictions:
     - The 0x representation requires an even number of hexadecimal values excluding the 0x (0-9, A-F). For example, the secret 0x123456789012345678 9ABCD is not allowed because the character length is odd, with 23 hexadecimal values excluding the 0x. The secret 0x0123456789012345678 9ABCD is allowed, with 24 hexadecimal values excluding the 0x.
     - The hexadecimal representation of CHAP secrets must only contain hexadecimal values. The 0x representation must only have the following characters: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, c, d, e, f, A, B, C, D, E, and F. Any other characters are not allowed.

   When you have successfully enabled the CHAP authentication, the Add/Ping iSCSI Target dialog box appears. For more information, see "Pinging a Target" on page 128.

Authenticating Mutual CHAP

With mutual CHAP authentication, the target authenticates the initiator and the initiator authenticates the target. Use mutual CHAP authentication for a two-way challenge/response security method.

To enable mutual CHAP authentication:

1. Log into the iSCSISelect utility by pressing **<Ctrl+S>** when prompted.
2. Select **Controller Configuration** and press **<Enter>**. A list of controllers is displayed.
3. Select a controller and press **<Enter>**. The Controller Configuration menu is displayed.
4. From the Controller Configuration menu, select **iSCSI Target Configuration** and press **<Enter>**.
5. Select **Add New iSCSI Target** and press **<Enter>**.
6. From the Add/Ping iSCSI Target dialog box, select **Authentication Method** and select **Mutual Chap**, and press **<Enter>**. The CHAP Configuration dialog box is displayed.

Figure 10-8 Mutual CHAP Configuration Dialog Box

7. Enter the target CHAP name, target secret, initiator CHAP name, and initiator secret. Select **OK** and press **<Enter>**.

   The target/initiator CHAP names can be any name or sequence of numbers over 12 and less than 16 characters. However, the name and secret on the target side must match the name and target on the initiator side.

   The target/initiator secret can be in string (for example, abcdefg23456) or hexadecimal (for example, 0x0123456789012345678ABCD) format.

   - If using a string format, the secret can be any name or sequence of numbers over 12 and less than 16 bytes long, where each character equals one byte.
   - If using a hexadecimal format, the secret must be at least 12 and less than 16 bytes long, where two characters equal one byte. Hexadecimal formatting restrictions:
     - The 0x representation requires an even number of hexadecimal values excluding the 0x (0-9, A-F). For example, the secret 0x123456789012345678ABCD is not allowed because the character length is odd, with 23 hexadecimal values excluding the 0x. The secret 0x0123456789012345678ABCD is allowed, with 24 hexadecimal values excluding the 0x.
     - The hexadecimal representation of CHAP secrets must only contain hexadecimal values. The 0x representation must only have the following characters: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, c, d, e, f, A, B, C, D, E, and F. Any other characters are not allowed.

   When you have successfully enabled the CHAP authentication, the Add/Ping iSCSI Target dialog box appears.

Pinging a Target

To ping a target:

1. From the Controller Configuration menu, select **iSCSI Target Configuration** and press **<Enter>**.
2. Select **Add/Ping iSCSI Target** or **Edit/Ping iSCSI Target** and press **<Enter>**. The "iSCSI Target IP Address" is the address that will be pinged.
3. From the Add/Ping iSCSI Target dialog box (Figure 10-2) or the Edit/Ping iSCSI Target dialog box (Figure 10-6), select **Ping** and press **<Enter>**.

   If the ping is successful, you are notified that the ping is successful. Figure 10-9 is an example of a successful ping.

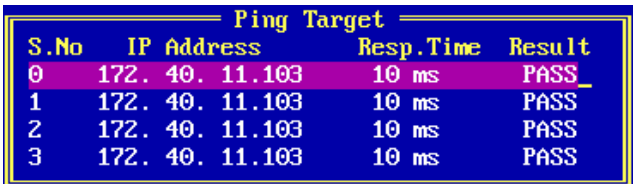
Ping Target
S.No IP Address Resp.Time Result
0 172. 40. 11.103 10 ms PASS
1 172. 40. 11.103 10 ms PASS
2 172. 40. 11.103 10 ms PASS
3 172. 40. 11.103 10 ms PASS

Figure 10-9 Successful Ping Screen

If the ping is unsuccessful you receive a failed message. There are several reasons for an unsuccessful ping. For more information see "Troubleshooting for the iSCSI Protocol" on page 224.

Viewing Advanced Target Properties

After you have logged into a target, you can view more information about that target.

To view more information about the target, from the Edit/Ping iSCSI Target dialog box, select the **Advanced** option and press **<Enter>**. Advanced information is displayed.

Figure 10-10 Advanced Target Properties Screen

Configuring LUN Settings

A LUN represents an individually addressable logical device that is part of a target. An initiator negotiates with a target to establish connectivity to a LUN.

To configure a LUN:

1. From the iSCSI Target Configuration screen, press **<F7>** to display the LUNs associated with the iSCSI node.

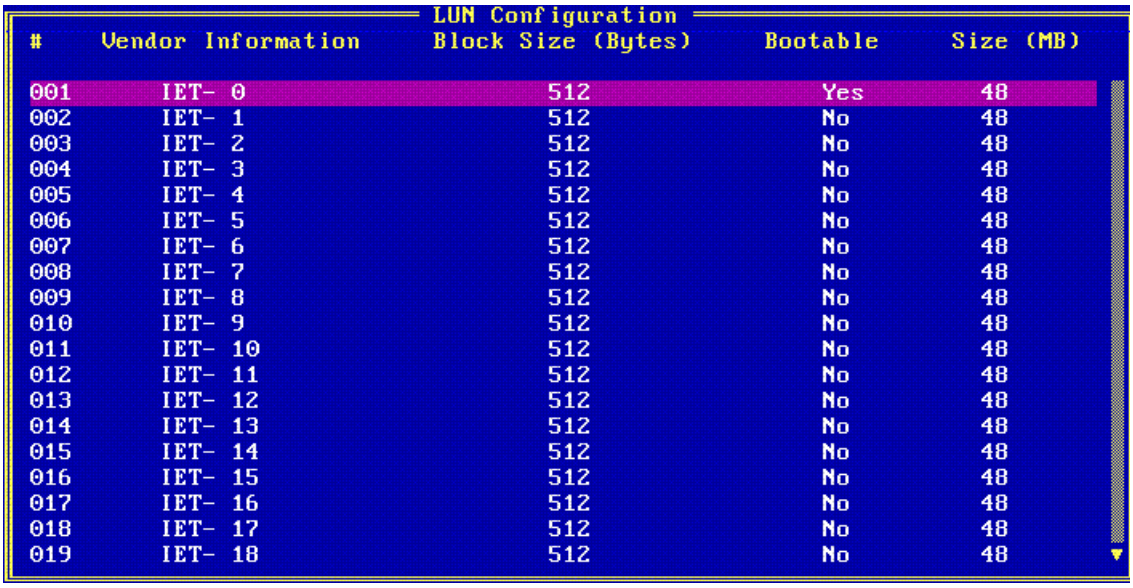

Figure 10-11 LUN Configuration Menu

2. Press **<F3>** to set the boot LUN if the target is a boot target. By setting the LUN to bootable, you can confirm that you have the boot target configured properly and see the LUN from which you are booting. By looking at the LUN size, you can also determine which target is which along with the LUN order.

   Note: The LUN order is determined by the target and is in the order listed.

If there are no LUNs available, the following message is displayed:

```
No LUN available, please check your configuration on the Target.
```

For more information, see "Troubleshooting for the iSCSI Protocol" on page 224.

Removing and Logging Out and In of a Configured Target

If you remove or delete a target, you log out of the target and remove it from the list of targets.

To remove a target, from the iSCSI Target Configuration screen, select the target and press the **<Delete>** key.

If you log out of a target, you log out of the target but the target is listed in the target list with the connection status of disconnected. With a logout, you are only deleting the target session. If you have logged out of a target, you can perform a login.

To log out of a target, from the iSCSI Target Configuration screen, select the target and press **<F6>**.

To log into a target, from the iSCSI Target Configuration screen, select the target and the disconnected target, and then press **<F5>** to establish the target session.

Booting the System

After you have configured the iSCSI initiator and target, you must reboot the system for the configurations to take effect. When you exit the iSCSISelect utility, the system automatically reboots and during system startup, the Emulex adapter BIOS is displayed. For example:

```
Controller#0 Port#0 Base 0xFCE60000 at Bus:01 Dev:00 Fun:02
Controller#0 Port#1 Base 0xFCEA0000 at Bus:01 Dev:00 Fun:03

<<< Press <Ctrl><S> for iSCSISelect(TM) Utility >>>

Initiator iSCSI Name:  iqn.2004-05.com.emulex
Initiator IP Address:  172. 40.  1.41
Initiator IP Address:  172. 40.  1.62
BIOS Not Installed.
```

Note: The iSCSI BIOS logs into the configured iSCSI boot target and shows its target/LUN information in the BIOS sign-on banner only if you have configured an iSCSI boot target. For more information, see "Setting Up a Basic iSCSI Boot Configuration" on page 105.

Discovering Targets through DHCP for iSCSI

For your target to be discovered by the initiator through DHCP, you must add the root path to the DHCP server:

1. From the DHCP server screen, select **Scope Options**, then right-click and select **Configure Options**.

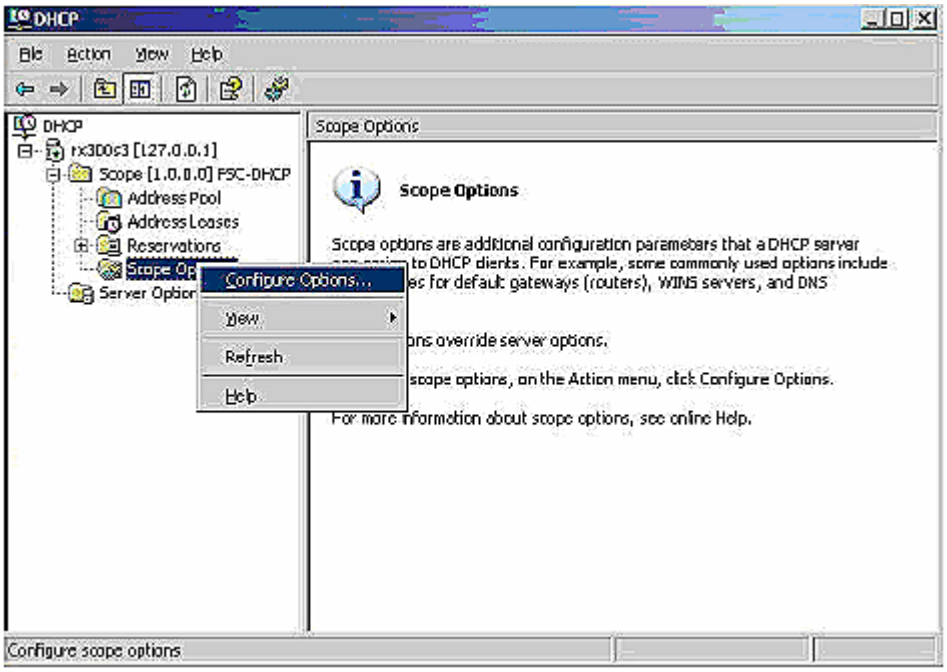

Figure 10-12 DHCP Server Screen

2. From the General tab, scroll down the list of available options and select **017 Root Path**.

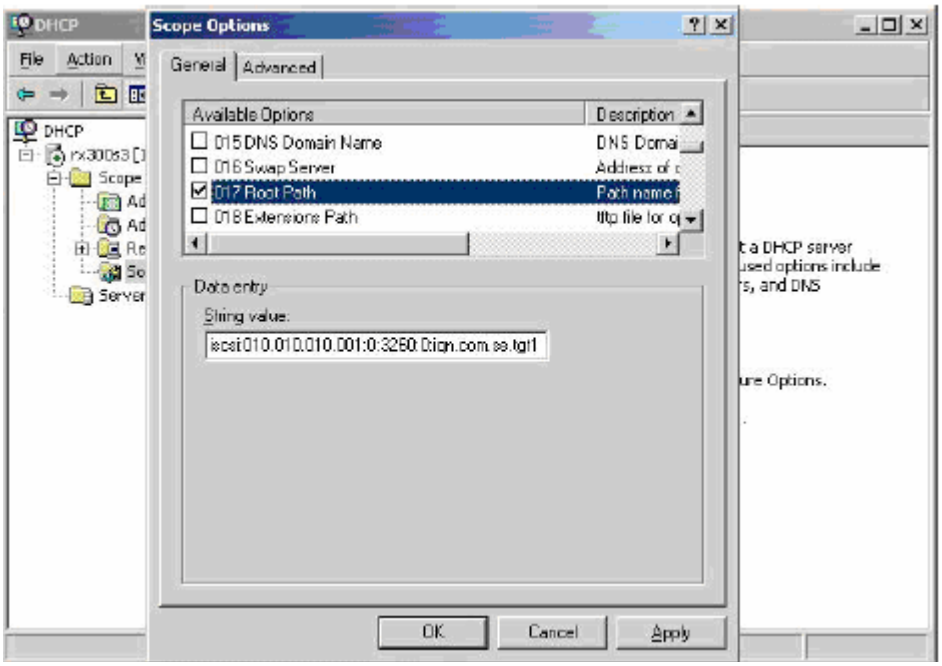

Figure 10-13 DHCP Server Scope Options

3. In the String Value box, add the location of the iSCSI target you want to use for iSCSI boot. Enter the string in the following format:

   ```
   iscsi: <ipaddress>:<protocol>:<iscsi port number>:<luns><target name>
   ```

   For example:

   ```
   iscsi:010.010.010.001:0:3260:0:iqn.1992-08.com.netap:sn.15729740
   ```

4. Click **Apply**. The DHCP server screen is ready to discover boot targets.

Enabling DHCP Discovery Through the iSCSISelect Utility

If your DHCP server supports DHCP discovery and you added the root path to the DHCP server, you can enable Discover Boot Target via DHCP using the iSCSISelect utility. By enabling Discover IPv4 Boot Target via DHCP, you can use DHCP discovery to provide the boot path from the DHCP server.

Note: If you leave Discover IPv4 Boot Target via DHCP disabled (default), you must manually configure iSCSI boot.

To enable DHCP discovery through iSCSISelect:

1. After configuring the iSCSI Initiator Name, select **Controller Properties** from the Controller Configuration menu and press **<Enter>**.
2. From the Controller Properties screen, select **Discover IPv4 Boot Target via DHCP** and press **<Enter>**. Enable the function by selecting **Enabled** from the pop-up menu and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

11. Configuring UEFI for Ethernet

Overview

UEFIBoot supports:

- uEFI version – uEFI 2.3.1 compatible drivers (backward compatible with 2.1)
- EDK version – EDK2 compatible drivers
- Supported EFI protocols – NII protocol, Configuration Access protocol, Component Name2 protocol, Driver Diagnostics protocol, Platform to Driver Configuration protocol, and Firmware Management Protocol
- Operating systems – Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, RHEL 6.x and newer, and SLES 11 SP2 and newer
- Multi-mode – Switch personalities from the HII menus
- Multichannel – Enable or disable multichannel and configure multichannel parameters from HII
- Blade Open Firmware Management Protocol and Universal Configuration Manager

  Note: Only applies to IBM products.

- Maximum controllers and ports (support for up to 96 physical controllers or 192 ports)
- Single driver – Single latest driver version supports all controllers in the system

This version of UEFIboot is loaded from flash into system memory.

For more information on loading and unloading UEFIBoot, see appendix E., "Loading and Unloading UEFIBoot from the UEFI Shell," on page 270.

When UEFIBoot is loaded in an EFI Shell, type "`drivers`" and press **<Enter>** to see if the driver is loaded.

Note: If you are using Dell adapters, refer to appendix F., "Dell UEFI," on page 271 for information on using the Dell UEFI utility.

Navigating the Emulex NIC Configuration Utility

Use the following methods to navigate the Emulex NIC configuration utility:

- Press the up/down arrows on your keyboard to move through menu options or fields. When multiple adapters are listed, use the up/down arrows to scroll to the additional adapters.
- Press the **<+>**, **<->**, or **<Enter>** keys to change numeric values.
- Press **<Enter>** to select a menu option, to select a row in a configuration screen, or to change a configuration default.
- Use the navigation entries on the page to move about the utility.
- Press **<Esc>** to exit the current screen and show the previous screen.

Starting the Emulex NIC Configuration Utility

Depending on the OEM UEFI configuration, the Emulex NIC configuration utility may appear under different setup menus in the OEM system firmware or BIOS (such as **System Settings > Network**).

To start the Emulex NIC configuration utility via the HII:

1. The Network screen shows a list of the adapters in the system. Your list may vary depending on the installed adapters.

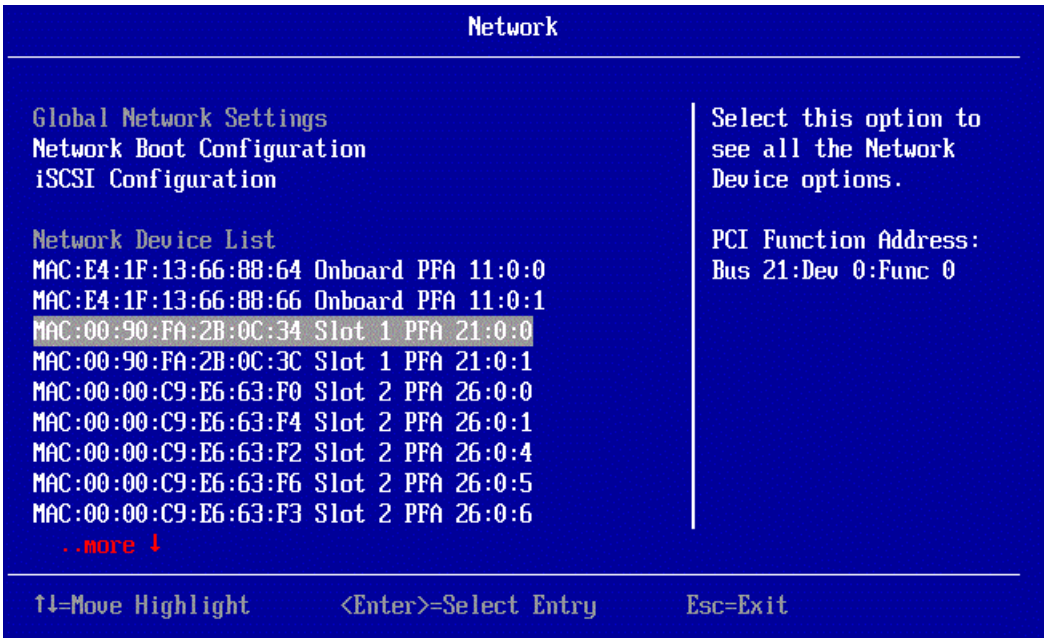

Figure 11-1 Emulex NIC Configuration Utility Network Screen

2. Select an adapter and press <Enter>. The Emulex NIC Selection Screen appears.

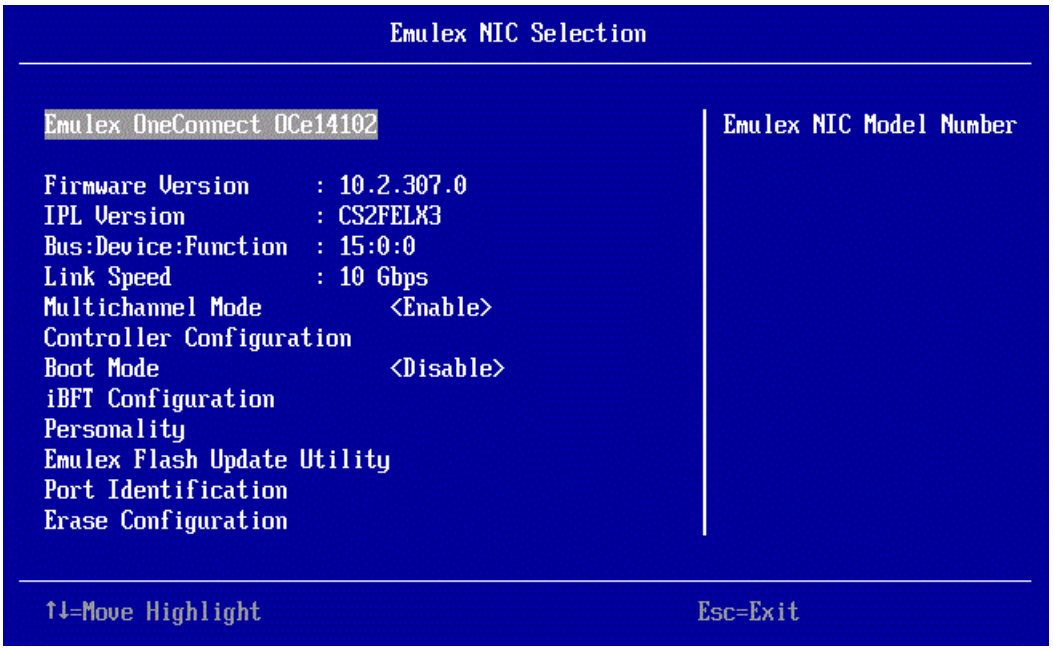

Figure 11-2 Emulex NIC Selection Screen

The Emulex NIC Selection screen displays the following adapter information and configuration options:

- Firmware Version – the current firmware version installed on the adapter. The firmware version is the same as the boot version.
- IPL Version – the current version installed on the adapter.
- Bus:Device:Function – the PCI bus, device, and function for the adapter. This information describes the location of the adapter in the PCI configuration space.
- Link Speed – the current maximum port speed on the adapter.
- Advanced Mode (not shown) – for more information, see "Advanced Mode Support" on page 137.
- Multichannel Mode – for more information, see "Configuring Universal Multichannel" on page 153.
- Controller Configuration – the available menu options depend on whether Multichannel Mode is enabled or disabled. For more information, see "Configuring the Controller When Multichannel is Disabled or Not Supported" on page 149 or "Configuring Universal Multichannel" on page 153.
- Boot Mode – for more information, see "Configuring Boot Mode" on page 138.
- iBFT Configuration - this menu is only available when Boot Mode is disabled. For more information, see "Configuring iBFT" on page 139.
- Personality – for more information, see "Configuring Personality" on page 145.

- Emulex Flash Update Utility – for more information, see "Downloading Firmware and Boot Code" on page 165.
- Port Identification – for more information, see "Identifying a Port" on page 168.
- Erase Configuration – for more information, see "Erasing Ports and Controller Configuration" on page 169.

Advanced Mode Support

Advanced Mode is a driver compatibility option. With Advanced Mode enabled, you can run Advanced Mode-aware drivers that provide advanced capabilities as listed in Table 11-1. With Advanced mode disabled, you can run older legacy inbox drivers that are not Advanced Mode-aware with the latest firmware versions.

Notes:

- Advanced Mode support is enabled by default on OCe11100-series 2-port and 4-port controllers and the LPe16202/OCe15100 CFA. On 4-port controllers, the Advanced Mode setting is not provided in the PXESelect/HII utilities. The Advanced Mode setting on these platforms is implicitly enabled and Advanced Mode-aware drivers must be installed. Compatibility with legacy drivers requires that Advanced Mode support be disabled on 2-port controllers.
- Advanced Mode is automatically supported by OCe14000-series controllers and requires no additional configuration.
- Advanced Mode is not supported on OCe10100-series controllers.

Table 11-1 Advanced Mode Capabilities (by Operating System)

Operating System	Advanced Mode Enabled	Advanced Mode Disabled (Legacy Mode)
Windows	16 RSS queues **Note:** Only supported on Windows 2008 R2, Windows Server 2012, and Windows Server 2012 R2. Remains four queues for earlier Windows versions.	4 RSS Queues
	VMQ lookahead split **Note:** VMQs are only supported on Windows Server 2008 R2 and later.	Lookahead split is silently ignored. There may be a small performance penalty for VMQs.
Linux and Citrix	16 RSS Queues	4 RSS Queues
	VFs/PFs can be increased up to 30	
VMware ESXi	For both 1500 and 9000 MTU: 16 NetQueues/PFs in non-VFA 4 NetQueues/PFs in VFA	1500 MTU – 8 NetQueues/PFs in non-VFA and 4 NetQueues/PFs in VFA. 9000 MTU – 4 NetQueues/PFs in both VFA and non-VFA

To enable Advanced Mode support:

Note: Changing the Advanced Mode setting requires a reboot.

1. On the Emulex NIC Selection Screen, select **Advanced Mode** and press **<Enter>**. The Advanced Mode pop-up menu appears.
2. Select **Enable** and press **<Enter>**.
3. Reboot the system.

Configuring Boot Mode

This setting configures the boot mode.

- Enable – iSCSI hardware initiator boot mode
- Disable – iSCSI software initiator boot mode

Note: When boot mode is disabled, the iBFT Configuration menu is available.

To configure boot mode:

1. On the Emulex NIC Selection Screen (Figure 11-2), select **Boot Mode** and press **<Enter>**. The Boot Mode pop-up menu appears.

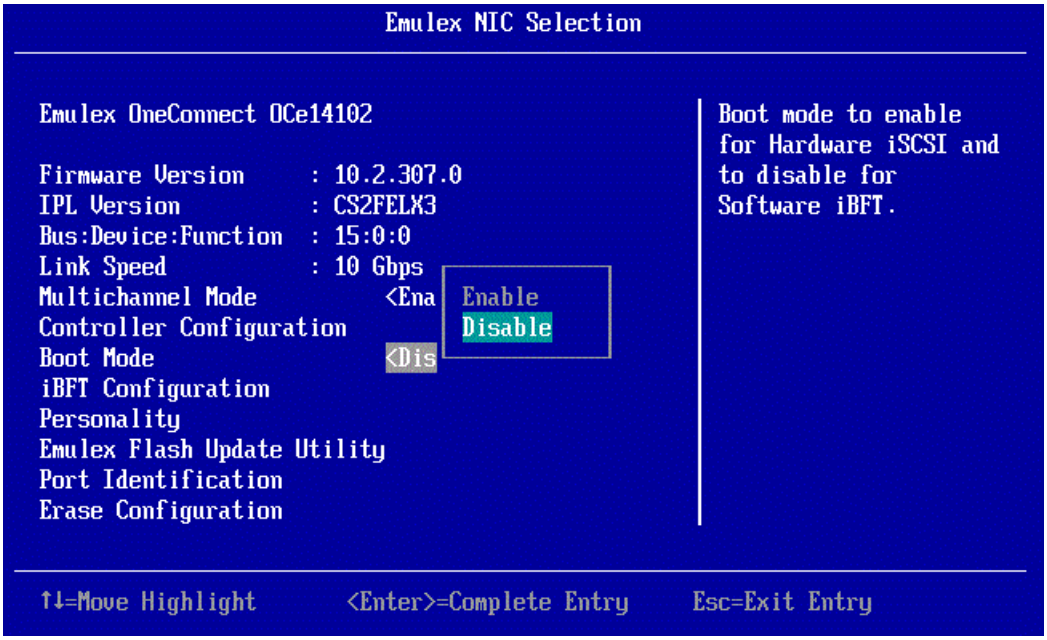

Figure 11-3 Boot Mode Pop-up Menu

2. Select **Enable** or **Disable** and press **<Enter>**.

Configuring iBFT

Note: Boot mode must be set to Disable to access the iBFT Configuration menu.

iSCSI configuration through the NIC interface (iBFT) is exactly the same as normal iSCSI configuration except it is performed through the NIC interface. In order for this to occur, you must use the operating system's NIC driver and an iBFT-aware operating system.

To configure iBFT:

1. On the Emulex NIC Selection Screen (Figure 11-2), select **iBFT Configuration** and press **<Enter>**.

   The iBFT Configuration screen appears.

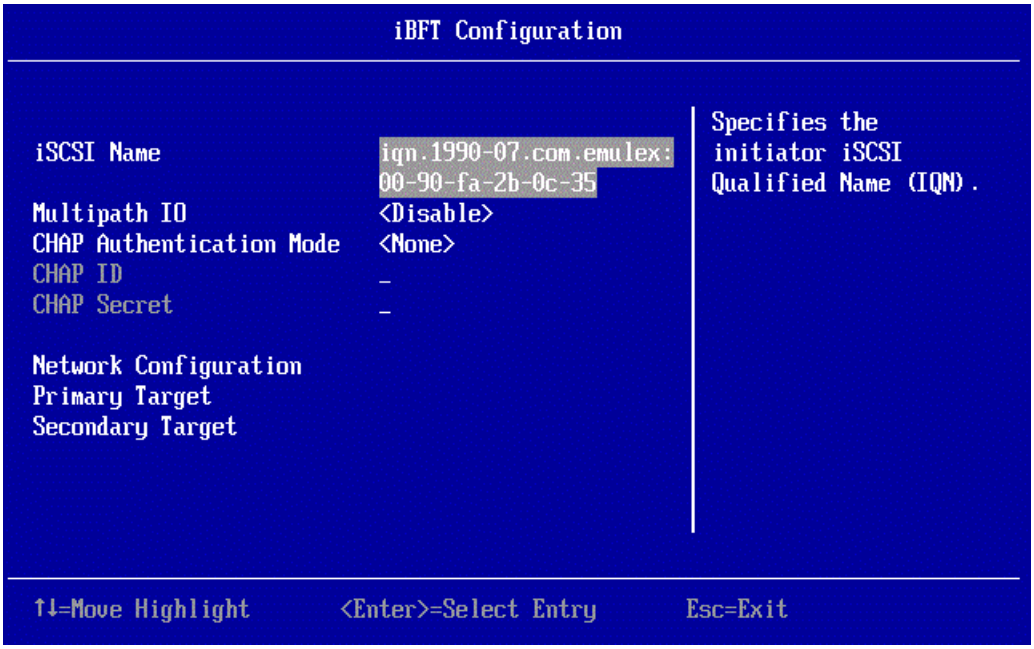

Figure 11-4 iBFT Configuration Screen

The iBFT Configuration screen enables you to perform the following tasks:

- Edit the iSCSI initiator name
- Enable multipath I/O
- Configure the CHAP authentication mode
- Configure the network settings
- Configure the primary or secondary targets

Once you have completed the iBFT configuration, you must save your changes.

To save changes:

1. Press **<Esc>** to return to the NIC Selection Menu.
2. Select **Save Changes** and press **<Enter>**.

Changing the iSCSI Name

To edit the iSCSI initiator name:

1. On the iBFT Configuration screen, highlight **iSCSI Name** and press **<Enter>**.

   This is a global setting. The iSCSI initiator name configured on one adapter is reflected on all adapters in the system.

   Note: HP systems are an exception to the previous statement. Each port on an HP system can be configured with a unique initiator name.

Selecting Multipath I/O

MPIO support allows the initiator to log in dual sessions to the same target. In this way I/O can be sent over either TCP/IP connection to the target. If one session fails another session can continue processing I/O without interruption to the application. In iSCSI target configuration, you have the option of setting dual network paths to a single boot LUN.

Note: Although MPIO boot support allows the initiator to log into multiple sessions, the iSCSI BIOS currently limits the number of sessions to two iSCSI sessions for a single boot LUN.

You must follow these steps in this order to configure MPIO boot support for each operating system.

1. Use the Emulex iSCSI configuration utility to configure the first path to a boot target.
2. Complete normal operating system installation.
3. Install third-party MPIO software for your operating system.
4. Configure the second path to a single boot LUN through the Emulex iSCSI configuration utility.

To select Multipath I/O:

1. On the iBFT Configuration screen, select **Multipath IO** and press **<Enter>**.
2. From the Multipath IO pop-up menu, select **Enable** or **Disable** and press **<Enter>**.

Configuring CHAP Authentication Mode

Emulex uses CHAP to authenticate initiators and targets for added network security. By using a challenge/response security mechanism, CHAP periodically verifies the initiator's identity. This authentication method depends on a secret known only to the initiator and the target. Although the authentication can be one-way, you can negotiate CHAP in both directions with the help of the same secret set for mutual authentication. You must make sure however, that what you configure on the target side, matches the initiator side. Emulex supports both one-way and mutual authentication.

To configure the CHAP authentication method:

1. On the iBFT Configuration screen, select **CHAP Authentication Mode** and press **<Enter>**.

2. From the CHAP Authentication Mode pop-up menu, select **None**, **One-way CHAP**, or **Mutual CHAP** and press **<Enter>**.
   - One-way CHAP – With one-way CHAP authentication, the target authenticates the initiator. Use one-way CHAP authentication for a one-way challenge/response security method – you must configure the CHAP ID and CHAP Secret, which is authenticated by the target.
   - Mutual CHAP – With mutual CHAP authentication, the target authenticates the initiator and the initiator authenticates the target. Use mutual CHAP authentication for a two-way challenge/response security method – you must configure different CHAP and mutual CHAP IDs and CHAP secrets.

   Note: When you configure the CHAP parameters, verify that those parameters match the parameters on the storage side.

3. Enter the appropriate CHAP ID and CHAP Secret and press **<Enter>**.

Configuring Network Settings

To configure the network settings:

1. On the iBFT Configuration screen, select **Network Configuration** and press **<Enter>**. The Network Configuration screen appears.

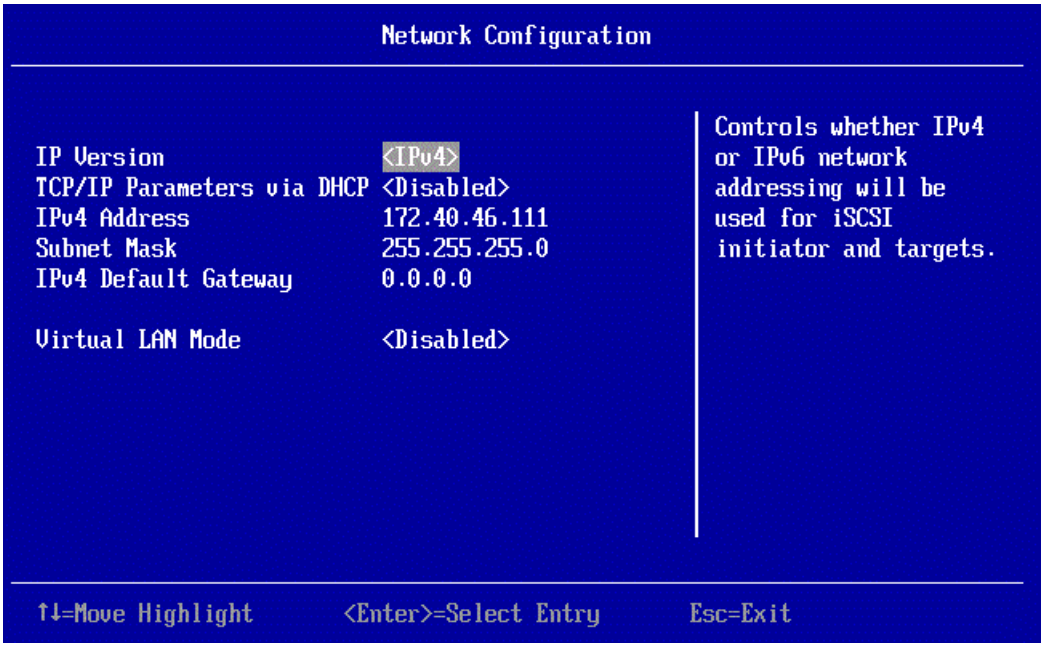

Figure 11-5 Network Configuration Screen

The Network Configuration screen enables you to perform the following tasks:

- Configure the initiator's IP version
- Configure TCP/IP parameters via DHCP

  Note: This option is only available when IPV4 is selected as the IP version.

- Configure iSCSI parameters via DHCP

Note: This option is only available when TCP/IP parameters via DHCP is enabled.

- Select virtual LAN mode

Once you have completed the network configuration, you must save your changes.

To save changes:

1. Press **<Esc>** to return to the iBFT Configuration screen.
2. Press **<Esc>** again to return to the NIC Selection Menu.
3. Select **Save Changes** and press **<Enter>**.

Configuring the Initiator IP Version

To configure the initiator's IP version:

1. On the Network Configuration screen (Figure 11-5), select **IP version** and press **<Enter>**.
2. From the IP Version pop-up menu, select **IPV4**, **IPV6**, or **None** and press **<Enter>**.

Configuring TCP/IP Parameters via DHCP

Note: This option is only available when IPV4 is selected as the IP Version.

This option controls the source of the initiator's IP address through DHCP or static assignment.

To configure TCP/IP parameters via DHCP:

1. On the Network Configuration screen (Figure 11-5), select **TCP/IP Parameters via DHCP** and press **<Enter>**.
2. From the TCP/IP Parameters via DHCP pop-up menu, select **Enabled** or **Disabled** and press **<Enter>**.
3. When this setting is disabled, you must enter the following information for the iSCSI initiator:
   - IPv4 address
   - Subnet mask
   - IPv4 default gateway

Configuring iSCSI Parameters via DHCP

Note: This option is only available when TCP/IP parameters via DHCP is enabled.

This option enables you to retrieve the iSCSI target parameters using DHCP.

To configure iSCSI parameters via DHCP:

1. On the Network Configuration screen (Figure 11-5), select **iSCSI Parameters via DHCP** and press **<Enter>**.
2. From the iSCSI Parameters via DHCP pop-up menu, select **Enabled** or **Disabled** and press **<Enter>**.

Selecting Virtual LAN Mode

When virtual LAN mode is enabled, a VLAN tag can be used by iSCSI boot.

To enable virtual LAN mode:

1. On the Network Configuration screen (Figure 11-5), select **Virtual LAN Mode** and press **<Enter>**.
2. From the Virtual LAN Mode pop-up menu, select **Enabled** and press **<Enter>**.

Configuring the Primary and Secondary Targets

To configure the iSCSI target parameters:

1. On the iBFT Configuration screen, select **Primary Target** or **Secondary Target** and press **<Enter>**.

   Note: Configuration of the primary and secondary targets is identical. For this reason, this section only covers the configuration of the primary target.

   The Primary Target screen appears.

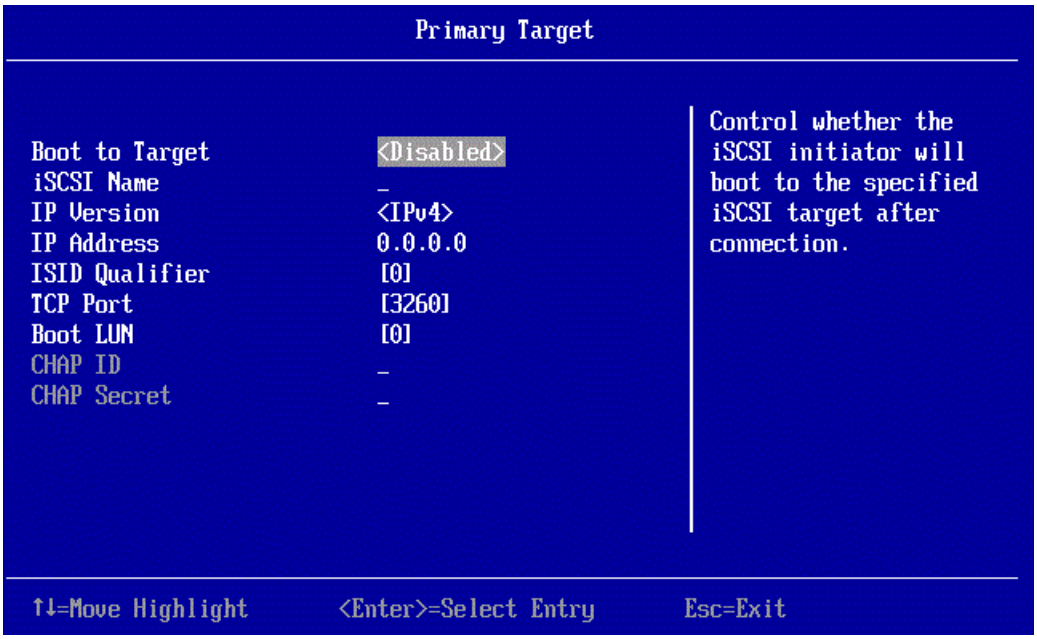

Figure 11-6 Primary Target Screen

The Primary Target screen enables you to configure the following items:

- Boot target
- iSCSI target name
- Target's IP version
- Target's IP address
- Target's ISID qualifier
- Target's TCP port
- Target's boot LUN

- Target's CHAP ID and secret

  Note: These options are only available when the initiator's CHAP authentication mode has been properly set.

Once you have completed the primary or secondary target configuration, you must save your changes.

To save changes:

1. Press **<Esc>** to return to the NIC Selection Menu.
2. Select **Save Changes** and press **<Enter>**.

Configuring the Boot Target

Note: Only one boot target can be enabled at a time. If the primary target has the boot target setting enabled, the secondary target must have the boot target setting disabled.

To configure the boot target:

1. On the Primary Target screen, select **Boot to Target** and press **<Enter>**.
2. From the Boot to Target pop-up menu, select **Enabled** or **Disabled** and press **<Enter>**.

Changing the Target's iSCSI Name

This setting specifies the iSCSI Qualified Name (IQN) of the specified target.

To edit the iSCSI target's name:

1. On the Primary Target screen, select **iSCSI Name** and press **<Enter>**.
2. Edit the target's name and press **<Enter>**.

Configuring the Target's IP Version

To configure the target's IP version:

1. On the Primary Target screen, select **IP version** and press **<Enter>**.
2. From the IP Version pop-up menu, select **IPV4** or **IPV6** and press **<Enter>**.

Configuring the Target's IP Address

To configure the target's IP address:

1. On the Primary Target screen, select **IP Address** and press **<Enter>**.
2. Enter the target's IP address and press **<Enter>**.

Configuring the Target's ISID Qualifier

The ISID qualifier is a unique ISID value to specify if you are connecting dual sessions to the same target portal group. This value ensures that you do not log into the same session twice. A combination of the initiator name, ISID qualifier, target name, and target portal group defines an iSCSI session. For the ISID qualifier, you can enter a number up to 65535.

To configure the target's ISID qualifier:

1. On the Primary Target screen, select **ISID Qualifier** and press **<Enter>**.
2. Enter the target's ISID qualifier value and press **<Enter>**.

Configuring the Target's TCP Port

To configure the target's TCP port:

1. On the Primary Target screen, select **TCP Port** and press **<Enter>**.
2. Enter the target's TCP port value and press **<Enter>**.

Configuring the Target's Boot LUN

To configure the target's boot LUN:

1. On the Primary Target screen, select **Boot LUN** and press **<Enter>**.
2. Enter the target's boot LUN value and press **<Enter>**.

Configuring the Target's CHAP ID and Secret

These options are only available when the initiator's CHAP authentication mode has been properly set.

To configure the target's CHAP ID and secret:

1. Ensure that the initiator's CHAP authentication mode is properly set.
2. On the Primary Target screen, select **CHAP ID** and press **<Enter>**.
3. Enter the target's CHAP ID value and press **<Enter>**.
4. On the Primary Target screen, select **CHAP Secret** and press **<Enter>**.
5. Enter the target's CHAP secret value and press **<Enter>**.

Configuring Personality

The "personality" reflects the protocol or protocols of the adapter. This option specifies a list of available protocols that can be configured on an adapter. Depending on the personalities for which the adapter is licensed, one or more of the following selections appears:

- NIC – The NIC personality implies that all the enabled functions provide NIC/TOE functionality.

  Note: TOE functionality is not supported on OCe14000-series adapters.

- iSCSI or FCoE – these personalities are enabled on one function per adapter port and include NIC functionality on the other enabled functions. There can be only one of each storage protocol on each port.
- NIC+RoCE – For more information on the NIC+RoCE personality, see "Selecting the NIC+RoCE Personality" on page 147.

  Note: The NIC+RoCE personality is available only on OCe14000-series adapters running Windows with multichannel and SR-IOV disabled.

- Custom – For more information on the Custom personality, see "Selecting the Custom Personality" on page 148.

The menu only displays the available personalities, including both free and licensed personalities.

To view the personalities supported on the adapter:

1. Select **Personality** on the Emulex NIC Selection Screen (Figure 11-2), and then press **<Enter>**. The Personality Selection screen appears.
2. Select the current personality setting and press **<Enter>**. A pop-up menu appears with a list of available personalities.

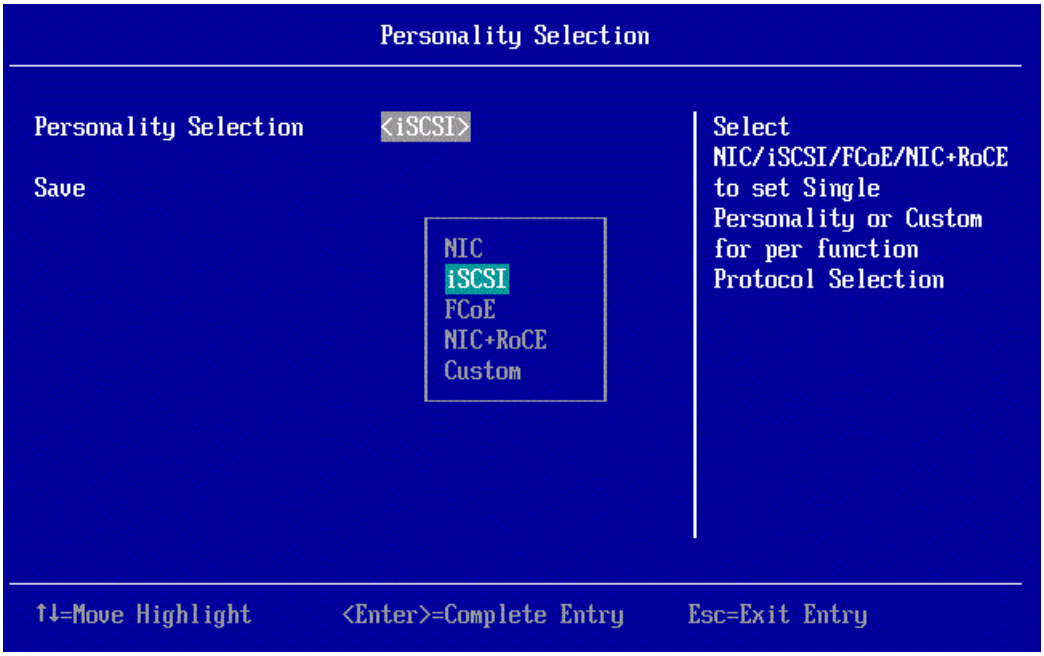

Figure 11-7 Personality Selection Screen with Pop-up Menu

To change the personality of the adapter:

1. On the Personality Selection pop-up menu (Figure 11-7), select the desired personality and press **<Enter>**.
2. Select **Save** and press **<Enter>.**

Note: Additional configuration changes may be made after changing the Personality setting; however, a reboot is required before the new Personality setting will take effect.

Selecting the NIC+RoCE Personality

Note: The NIC+RoCE personality is available only on OCe14000-series adapters running Windows with multichannel and SR-IOV disabled.

The NIC+RoCE personality implies that all the enabled functions provide RoCE functionality.

When NIC+RoCE is enabled, you must select a NIC+RoCE profile. The NIC+RoCE profile allows you to select the appropriate profile for your particular system setup. The NIC+RoCE profile choices include:

- RoCE-1 – For the RoCE-1 profile, check the Implementer's Lab on the Emulex website for any updated information on use cases for the RoCE-1 profile.
- RoCE-2 – Choose the RoCE-2 profile for SMB Direct on Windows Server 2012 and Windows Server 2012 R2.

To select the NIC+RoCE personality:

1. From the Personality Selection screen (Figure 11-7), select **NIC+RoCE** and press **<Enter>**. The NIC+RoCE Profile pop-up menu appears.

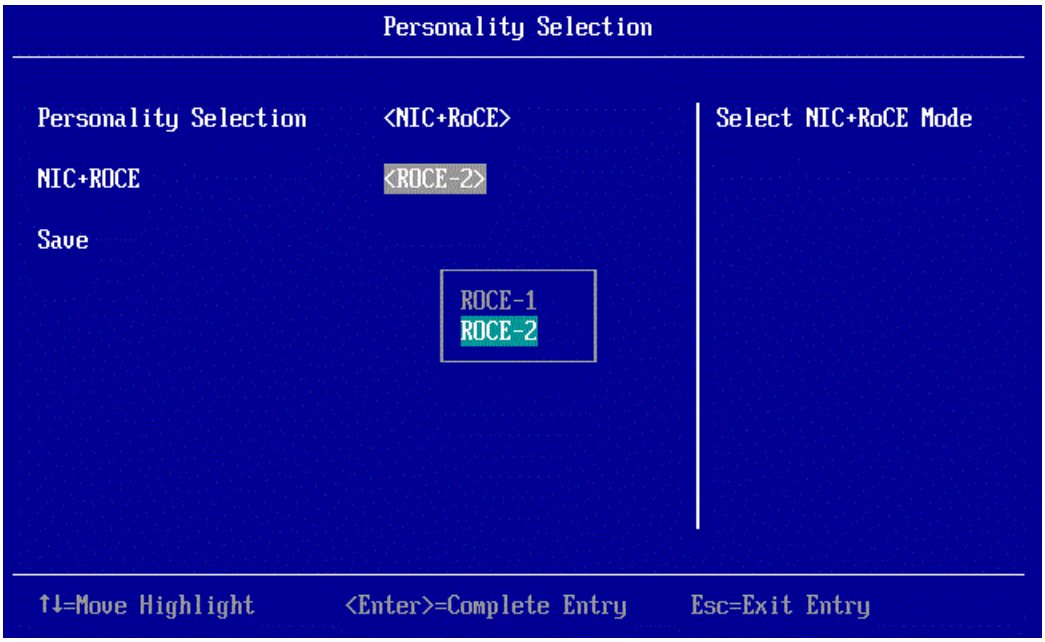

Figure 11-8 NIC+RoCE Profile Screen with Pop-Up Menu

2. Select the desired NIC+RoCE profile and press **<Enter>**.
3. Select **Save** and press **<Enter>.**

Note: Additional configuration changes may be made after changing the Personality setting; however, a reboot is required before the new Personality setting will take effect.

Selecting the Custom Personality

The Custom personality allows you to select the protocol type for each function. iSCSI and FCoE personalities may only be enabled on one function per adapter port.

Note: There cannot be two iSCSI functions and two FCoE functions on a single port.

To select the Custom personality:

1. From the Personality Selection screen (Figure 11-7), select **Custom** and press **<Enter>**. The Custom Personality Selection screen appears.

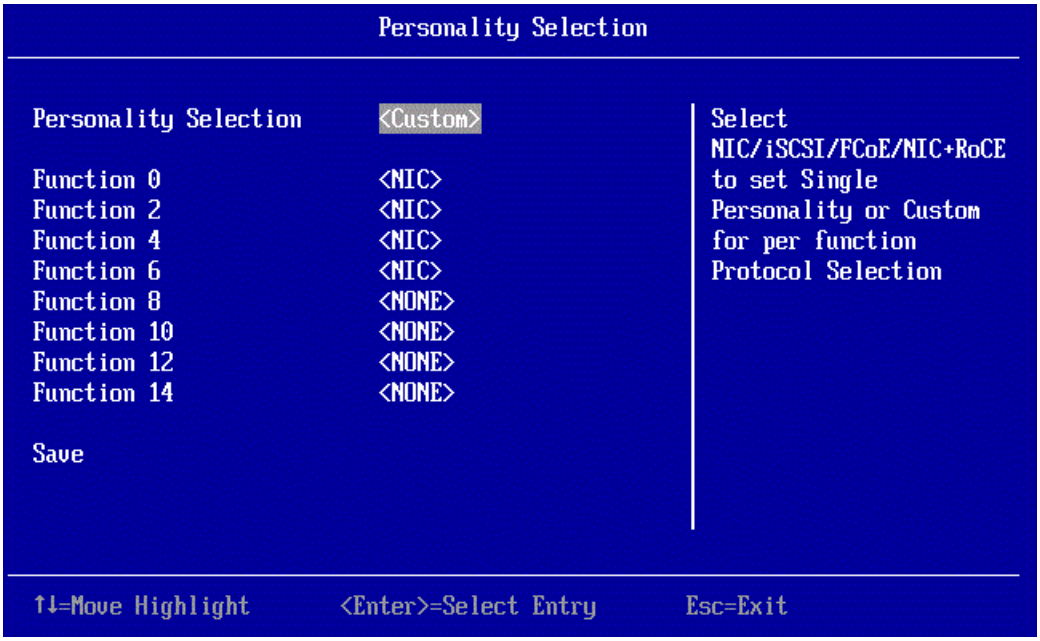

Figure 11-9 Custom Personality Selection Screen

2. Select the desired personality for the appropriate function from the pop-up menu and press **<Enter>**.
3. Select **Save** and press **<Enter>.**

Note: Additional configuration changes may be made after changing the Personality setting; however, a reboot is required before the new Personality setting will take effect.

Configuring the Controller When Multichannel is Disabled or Not Supported

Note: If your adapter has Multichannel Mode enabled, refer to "Configuring Universal Multichannel" on page 153. If you are using an IBM adapter, refer to "Configuring Multichannel for IBM Adapters" on page 158.

When Multichannel Mode is disabled, or it is not supported, the following Controller Configuration screen appears when you select **Controller Configuration** on the Emulex NIC Selection Screen.

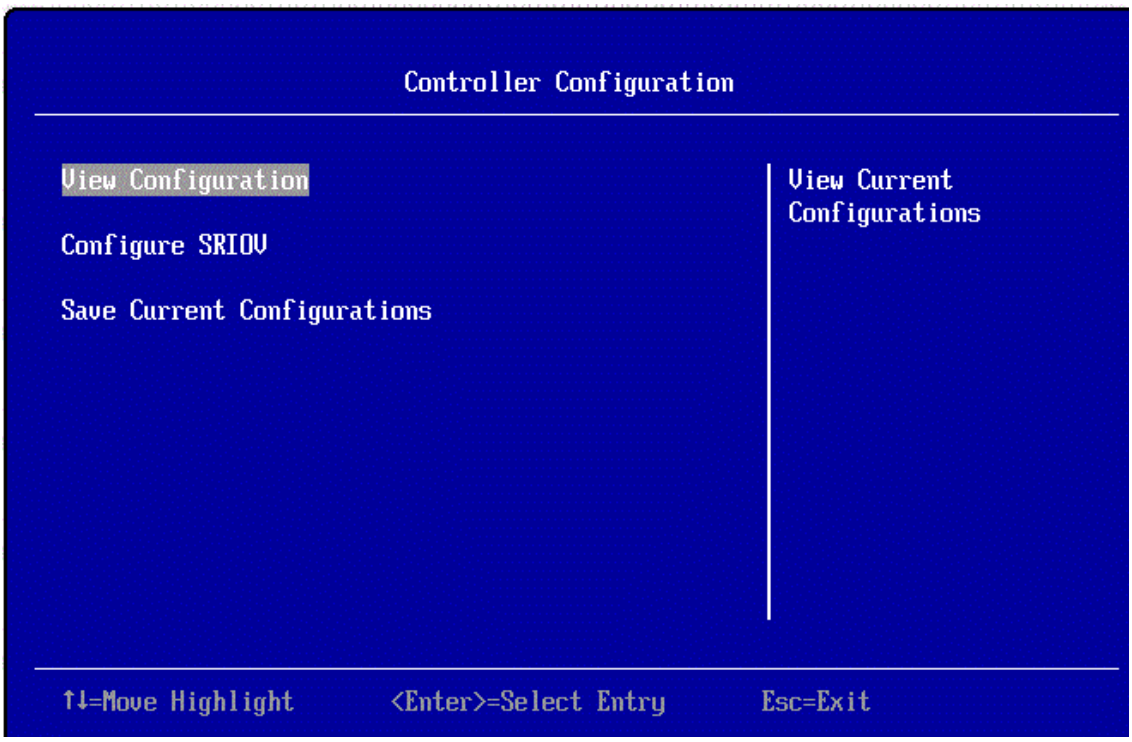

Figure 11-10 Controller Configuration Screen

The Controller Configuration screen enables you to perform the following tasks:

- View the current configuration
- Configure SR-IOV
- Configure NIC Mode

  Note: This setting is only available when SR-IOV is enabled, the Personality Selection is set to "NIC", and a two-port OCe14000-series adapter is in use.

- Save the current configuration

Viewing the Configuration

To view the current configuration:

1. On the Controller Configuration screen, select **View Configuration** and press **<Enter>**. The View Configuration screen appears.

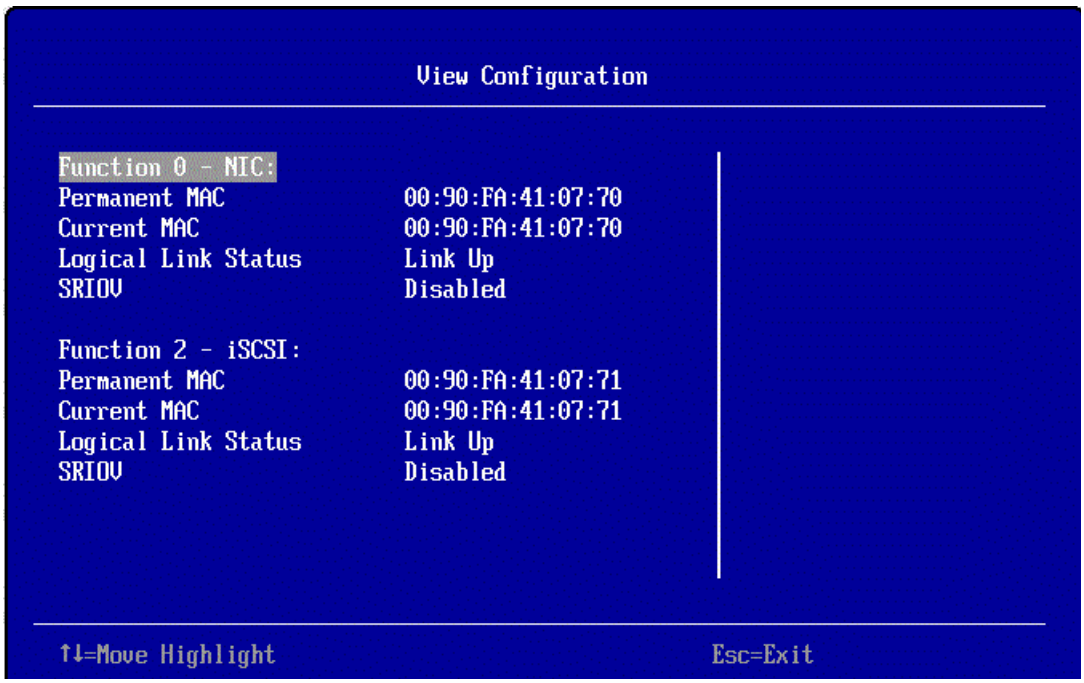

Figure 11-11 View Configuration Screen

From the View Configuration screen, you can view information for that specific function, including the permanent and current MAC addresses, the logical link status, and the SR-IOV status for NIC functions.

2. When you are finished viewing the configurations, press **<Esc>** to return to the Controller Configuration screen.

Configuring SR-IOV

If your system BIOS supports SR-IOV, you can enable it. SR-IOV support can only be enabled when multichannel is disabled or it is not supported.

Notes:

- SR-IOV is not supported with the NIC+RoCE personality.
- SR-IOV is only available for NIC functions and not for storage (iSCSI or FCoE) functions.

To configure SR-IOV:

1. On the Controller Configuration screen, select **Configure SRIOV** and press **<Enter>**. The Configure SRIOV screen appears.

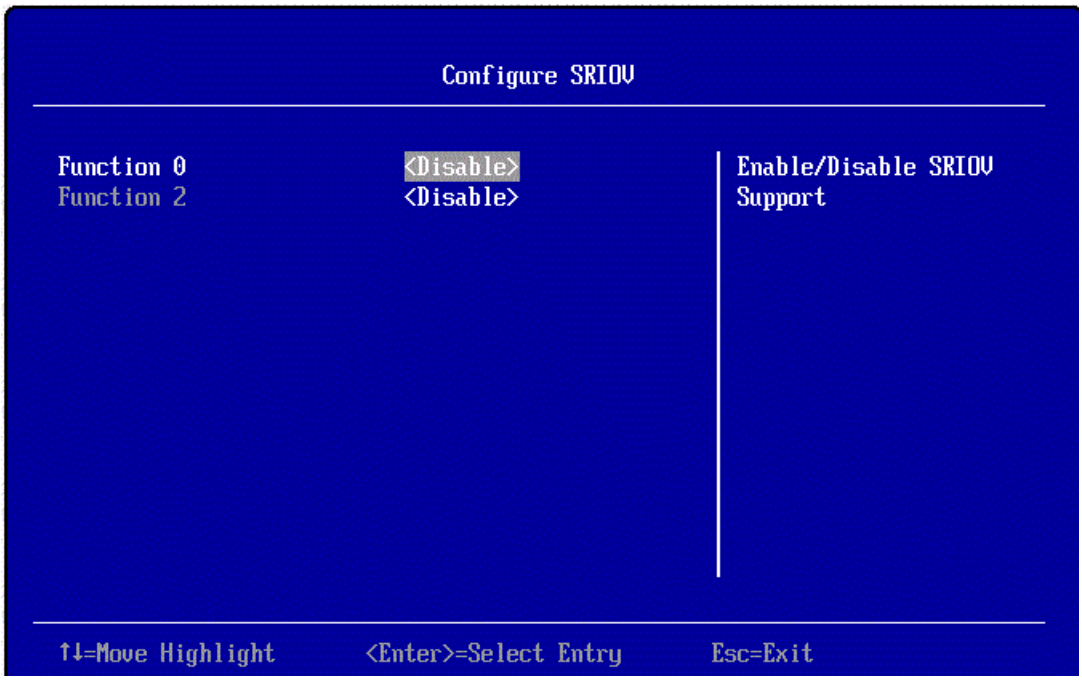

Figure 11-12 Configure SRIOV Screen

2. Select the current setting for a particular NIC function and a pop-up menu appears.
3. Select **Enable** or **Disable** and press **<Enter>**.
4. When you are finished, press **<Esc>** to return to the Controller Configuration screen.

For more information on SR-IOV configuration, see the appropriate Emulex driver manual.

Configuring NIC Mode

Note: This setting is only available when SR-IOV is enabled, the Personality Selection is set to "NIC", and a two-port OCe14000-series adapter is in use.

This setting allows you to control the VF count on a two-port OCe14000-series adapter. The choices include:

- NIC Only Profile – the VF count is restricted to 31 VFs per port and QoS is supported for those VFs.
- NIC-ETS Disabled – the VF count is set to 63 VFs per port but QoS is not supported for those VFs.

To select the NIC Mode:

1. From the Configure SRIOV screen (Figure 11-12), select the **NIC Mode** setting for a particular NIC function and a pop-up menu appears.

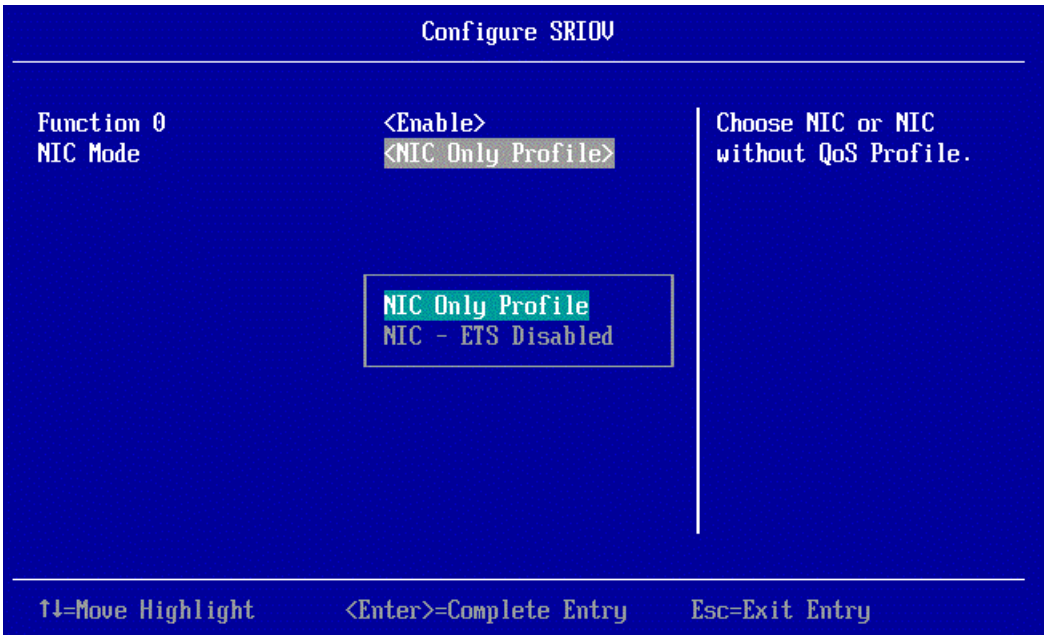

Figure 11-13 Configure NIC Mode Pop-up Menu

2. Select **NIC Only Profile** or **NIC-ETS Disabled** and press **<Enter>**.
3. When you are finished, press **<Esc>** to return to the Controller Configuration screen.

Saving the Current Configuration

To save the configuration changes, on the Controller Configuration screen, select **Save Current Configurations** and press **<Enter>**.

Configuring Universal Multichannel

Note: UMC is only available on OCe11100-series and OCe14000-series adapters.

Note: If your adapter has Multichannel Mode enabled and also supports IBM Virtual Fabric Mode or IBM Unified Fabric Protocol Mode, refer to "Configuring Multichannel for IBM Adapters" on page 158 for additional information. If Multichannel Mode is disabled or not supported on the adapter, refer to "Configuring the Controller When Multichannel is Disabled or Not Supported" on page 149.

UMC provides the ability to configure multiple PCI functions or I/O channels for each adapter port. For additional information on UMC support, see the *Emulex Universal Multichannel Reference Guide*.

Note: When UMC is enabled, you must configure the multichannel settings (minimum and maximum bandwidths) for iSCSI and FCoE storage functions in the NIC BIOS before they can be configured further from their respective utilities (iSCSI or FCoE BIOS). Otherwise, the Logical Link for that function will still show as down, and you will not be able to log into targets or find LUNs behind those targets.

Note: Multichannel functionality is only supported on OneConnect adapters running in 10 Gb mode. The 1 Gb mode does not support UMC.

If multichannel functionality is supported on your system, the Emulex UEFI NIC utility enables you to perform the following tasks:

- Enable or disable multichannel functionality (Multichannel Mode)
- View the current controller configuration
- Configure the minimum and maximum bandwidth for each channel
- Configure the LPVID for each channel

Note: Your system may not support all multichannel options.

Note: For OCe14000-series adapters, the Emulex NIC configuration utility displays all of the functions on a port, regardless of whether the system supports ARI or not. For additional information on ARI, see "ARI Support" on page 154.

To enable multichannel support:

1. On the Emulex NIC Selection screen (Figure 11-2), select **Multichannel Mode** and press **<Enter>**. The Multichannel Mode pop-up menu appears.
2. Select **Enable** to activate multichannel support and press **<Enter>**.

To configure the multichannel configuration:

1. On the Emulex NIC Selection screen, select **Controller Configuration** and press **<Enter>**. A list of available options is displayed.

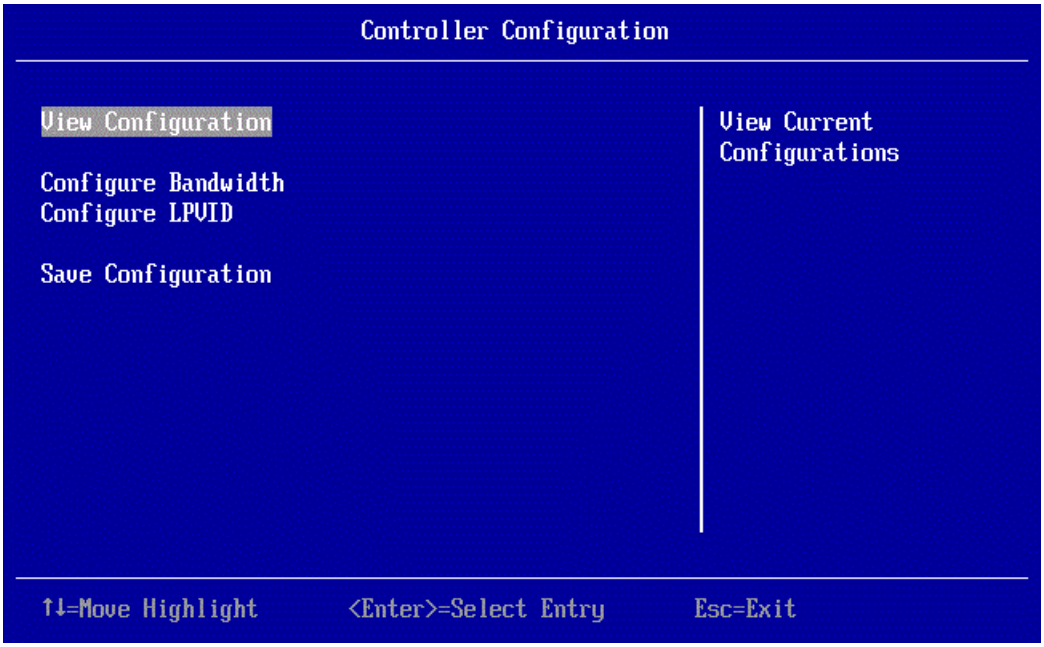

Figure 11-14 Controller Configuration Screen

The Controller Configuration screen enables you to perform the following tasks:

- View the current configuration of each function.
- Configure the minimum and maximum bandwidth percentage.
- Configure the LPVID per function.
- Save the current configuration.

ARI Support

The OCe14000-series adapters support ARI, which provides the ability to configure additional PCI functions or I/O channels for each physical adapter port when multichannel is enabled.

You can configure up to 16 functions on a one-port OCe14400-series adapter, up to eight functions per port on a one or two-port OCe14100-series adapter, and up to four functions per port on a four-port OCe14100-series adapter.

The maximum number of functions allowed on an adapter is controlled by the adapter's IPL file and the system's support for ARI.

The following requirements must be met in order to support more than eight functions on an adapter.

- The system hardware (the motherboard and BIOS) must support ARI.
- ARI must be enabled in the system BIOS.
- The host operating system must support ARI:
  - Windows Server 2012 and newer versions

- RHEL 6.4 and newer versions
- SLES 11 SP2 and newer versions
- ESXi 5.0 and newer versions

- The application management tools, including the OneCommand Manager application must support ARI.
- ARI must be enabled in the firmware using the OneCommand Manager application.

If these conditions are not met, you may be able to configure more than eight functions, but only up to eight functions will be running and discovered after a reboot.

Viewing the Configuration

To view the current multichannel configuration:

1. On the Controller Configuration screen, select **View Configuration** and press **<Enter>**. The View Configuration screen appears.

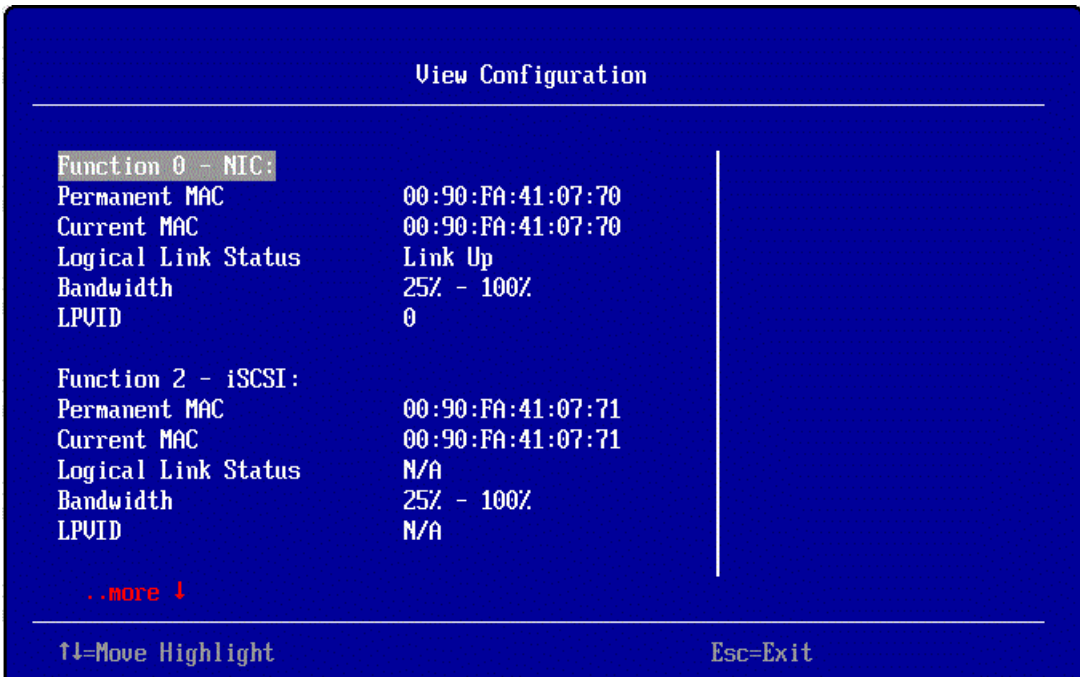

Figure 11-15 Multichannel Configuration for Function 0 Screen

From the View Configuration screen, you can view information for that specific function, including the permanent and current MAC addresses, the logical link status, the minimum and maximum bandwidth settings, and LPVID of all of the NIC functions.

Note: Logical Link Status and LPVID for storage functions (iSCSI and FCoE) display as "N/A".

2. When you are finished viewing the configurations, press **<Esc>** to return to the Controller Configuration screen.

Configuring Minimum and Maximum Bandwidth

To configure bandwidth:

1. On the Controller Configuration screen, select **Configure Bandwidth** and press **<Enter>**. The Configure Bandwidth screen appears.

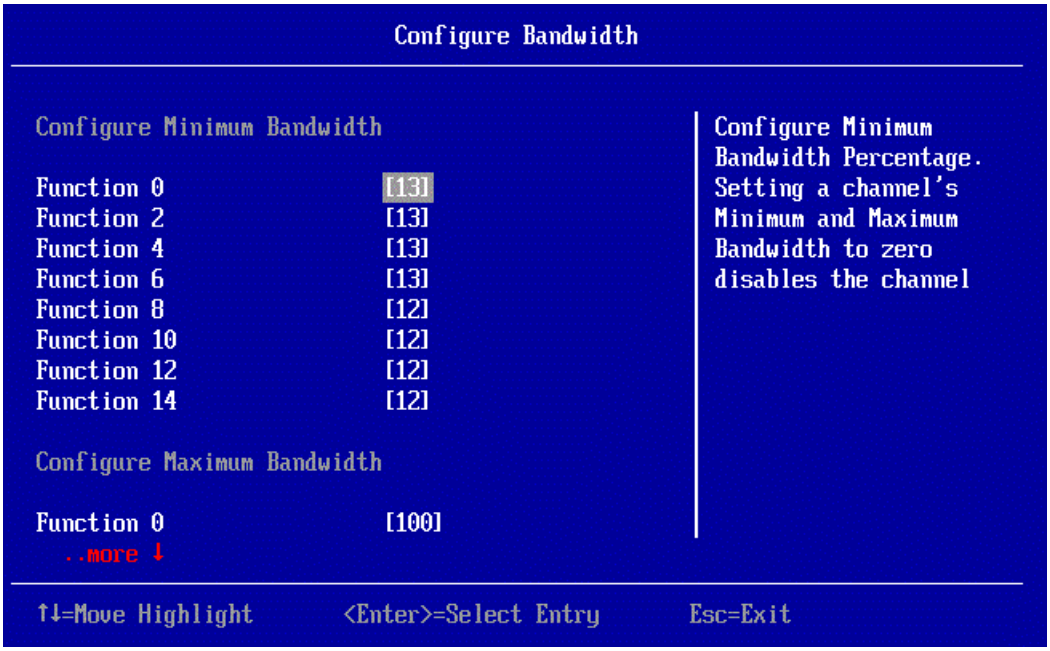

Figure 11-16 Configure Bandwidth Screen

2. Select a specific function under Configure Minimum Bandwidth or Configure Maximum Bandwidth and press **<Enter>**.
   - The Minimum Bandwidth value is the least amount of bandwidth that the function can provide. It is represented as a percentage. The Minimum Bandwidth value must be less than or equal to the Maximum Bandwidth value. The total of the Minimum Bandwidth values for all enabled functions on that port must be equal to 100.

     Note: A Minimum Bandwidth value of 0 is a valid value. When all of the partitions' Minimum Bandwidth values are zero, the bandwidth is distributed equally among the current active partitions. If a specific partition's Minimum Bandwidth and Maximum Bandwidth values are 0, that partition's logical link will be brought down.

   - The Maximum Bandwidth value is the greatest amount of bandwidth that the function can provide. It is represented as a percentage.
3. Enter the value for the specified function and press **<Enter>**.
4. When you are finished configuring bandwidths, press **<Esc>** to return to the Controller Configuration screen.

Note: To disable a function, set the Minimum Bandwidth and Maximum Bandwidth values to 0.

Configuring the LPVID

The LPVID is used to enforce a VLAN ID on all traffic originating from an IP address, channel, or PCI function. If the operating system for that PCI function has set up a VLAN ID, then the operating system-configured VLAN ID takes precedence over the LPVID for transmit packets while the operating system-configured VLAN ID and LPVID-tagged packets will both be received. If the operating system has not set up any VLAN IDs, then the LPVID is used for tagging.

Note: LPVID and user-configured VLAN IDs from the operating system must be different.

Note: LPVIDs also need to be configured on the switch port.

Each LPVID must be unique and is relevant for NIC traffic only. The LPVID is not supported for storage functions. For iSCSI storage functions, you must configure a VLAN ID through iSCSISelect or through the host. For additional information, see "Configuring VLAN ID and VLAN Priority" on page 113.

To configure an LPVID:

1. On the Controller Configuration screen, select **Configure LPVID** and press **<Enter>**. The Configure LPVID screen appears.

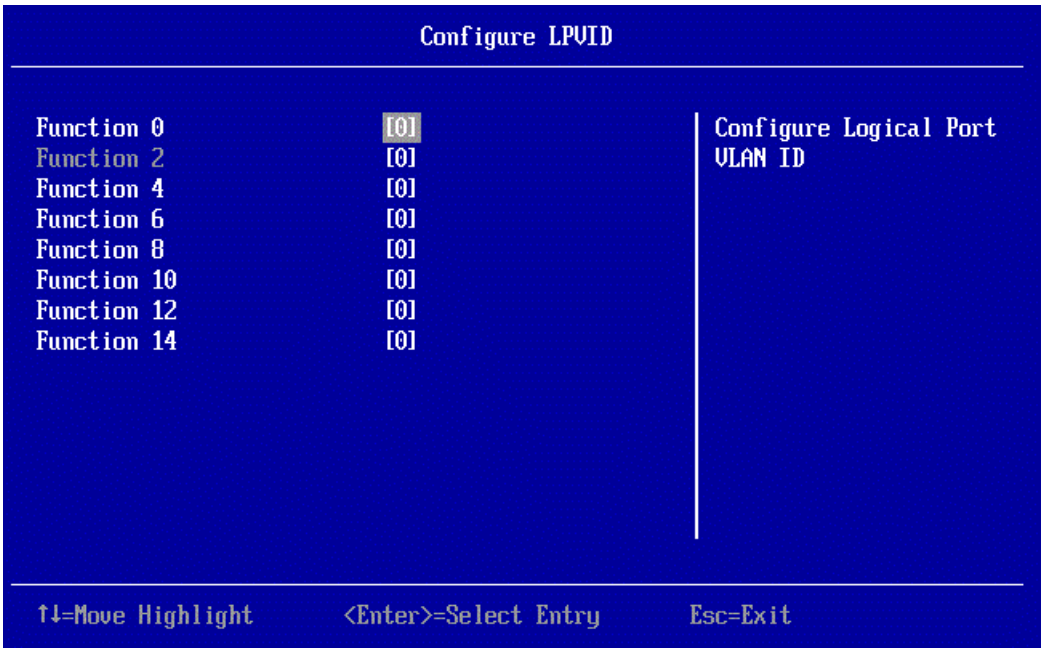

Figure 11-17 Configure LPVID Screen

2. Select the LPVID value for a specific function and press **<Enter>**.
3. Enter a value and press **<Enter>**. The LPVID range is 2-4094. A value of 0 disables the LPVID.

   Note: LPVID values 1 and 4095 are currently reserved and cannot be used or configured.

4. When you are finished configuring LPVIDs, press **<Esc>** to return to the Controller Configuration screen.

Saving the Configuration

To save the configuration changes, on the Controller Configuration screen, select **Save Configuration** and press **<Enter>**.

Configuring Multichannel for IBM Adapters

Note: This section only pertains to certain Emulex OneConnect adapters that support IBM Virtual Fabric multichannel or Unified Fabric Protocol.

Multichannel provides the ability to configure multiple PCI functions or I/O channels for each adapter port.

Note: Setting up IBM Virtual Fabric or UFP multichannel depends on cooperation with adjacent switches.

To enable multichannel support:

1. On the Emulex NIC Selection screen, select **Multichannel Mode** and press **<Enter>**. The Multichannel Mode pop-up menu appears.

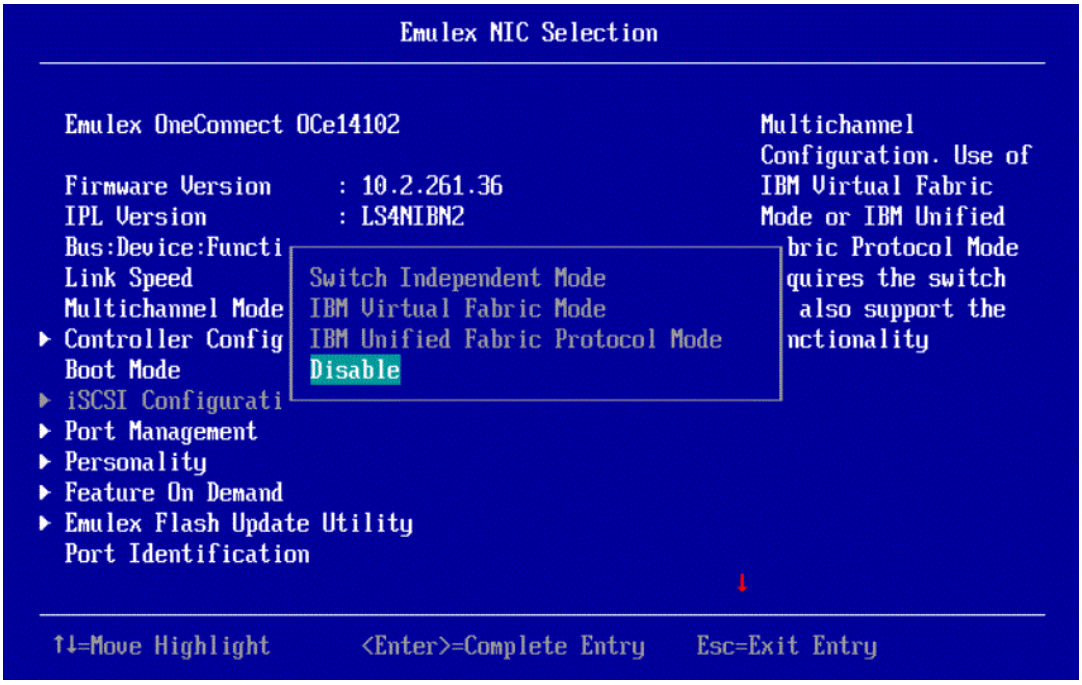

Figure 11-18 Multichannel Mode Dialog Box

2. Select one of the following settings and press **<Enter>**:
   - Switch Independent Mode
   - IBM Virtual Fabric Mode
   - IBM Unified Fabric Protocol Mode

- Disabled

Note: For more information on the available Multichannel Modes, see "Multichannel Modes".

With the Multichannel Mode selected, you can now configure multichannel support. See "Multichannel Configuration" on page 159 for more information.

Multichannel Modes

Note: The following modes are only available on certain adapters and systems that support IBM Virtual Fabric and Unified Fabric Protocol modes.

An IBM Virtual Fabric-enabled switch provides the ability to configure an LPVID for a virtual channel or I/O channel on an adapter port. If multichannel is supported on your system, you can select one of the following modes:

- IBM Virtual Fabric Mode – select this mode when a OneConnect adapter is attached to an IBM Virtual Fabric-enabled switch.
- IBM Unified Fabric Protocol Mode – select this mode when a OneConnect adapter is attached to an IBM UFP-enabled switch.

  Note: Some IBM switches support both UFP and IBM Virtual Fabric Mode.

- Switch Independent Mode – select this mode if you are using a switch other than an IBM Virtual Fabric or UFP-enabled switch.

Note: Multichannel functionality is only supported on OneConnect adapters running in 10 Gb mode. The 1 Gb mode does not support multichannel.

Note: An LPVID is optional for IBM Virtual Fabric Mode, but it is required for every function when using Switch Independent Mode.

Multichannel Configuration

The available options for configuring multichannel are dependent on the selected multichannel mode. Refer to the appropriate section below based on the mode you have selected.

IBM Virtual Fabric Mode Multichannel Configuration

To configure the multichannel configuration when the Multichannel Mode is set to IBM Virtual Fabric Mode:

1. On the Emulex NIC Selection screen, select **Controller Configuration** and press **<Enter>**. A list of available options is displayed.

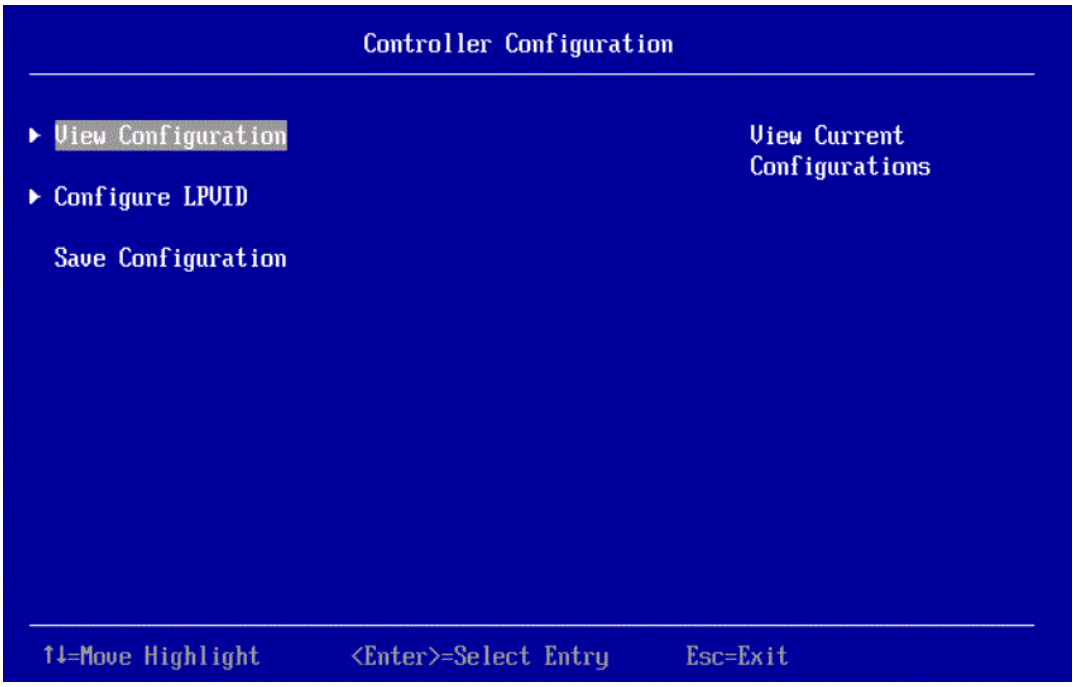

Figure 11-19 IBM Virtual Fabric Mode Controller Configuration Screen

2. From the Controller Configuration screen, you can perform the following tasks:
   - View the current configuration of each function – see "Viewing the Configuration" on page 155.
   - Configure the LPVID per function – see "Configuring the LPVID" on page 157.
   - Save the current configuration – see "Saving the Configuration" on page 158.

IBM Unified Fabric Protocol Mode Multichannel Configuration

To configure the multichannel configuration when the Multichannel Mode is set to IBM Unified Fabric Protocol Mode:

1. On the Emulex NIC Selection screen, select **Controller Configuration** and press **<Enter>**. A list of available options is displayed.

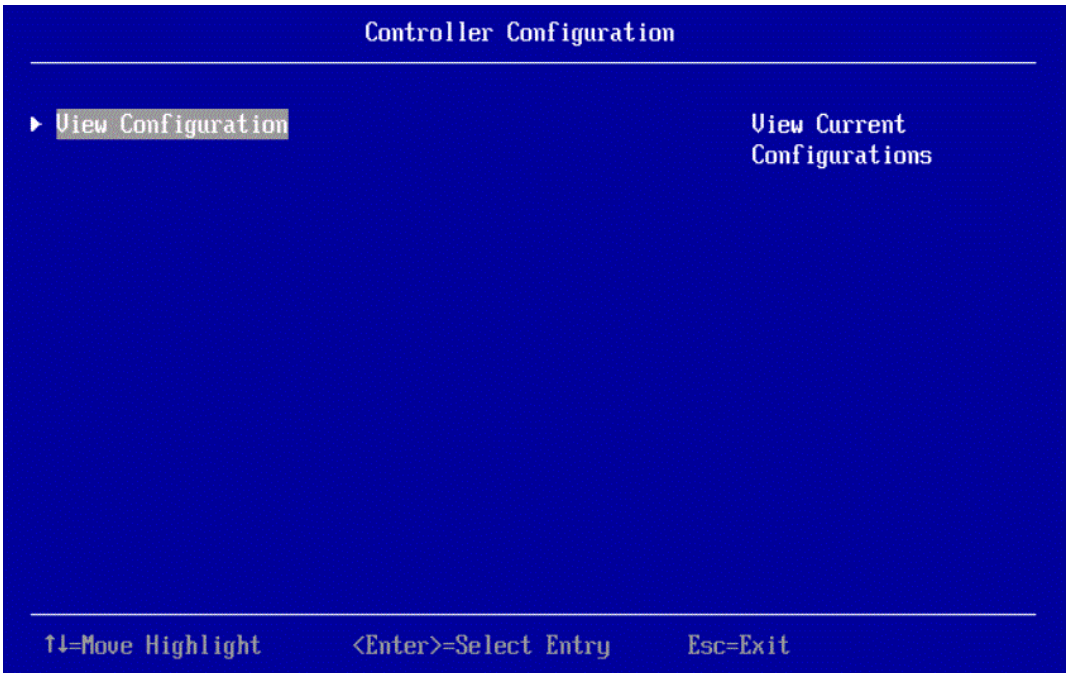

Figure 11-20 IBM Unified Fabric Protocol Mode Controller Configuration Screen

2. From the Controller Configuration screen, you can perform the following tasks:
   - View the current configuration of each function – see "Viewing the Configuration" on page 155 for more information.

Switch Independent Mode Multichannel Configuration

To configure the multichannel configuration when the Multichannel Mode is set to Switch Independent Mode:

1. On the Emulex NIC Selection screen, select **Controller Configuration** and press **<Enter>**. A list of available options is displayed.

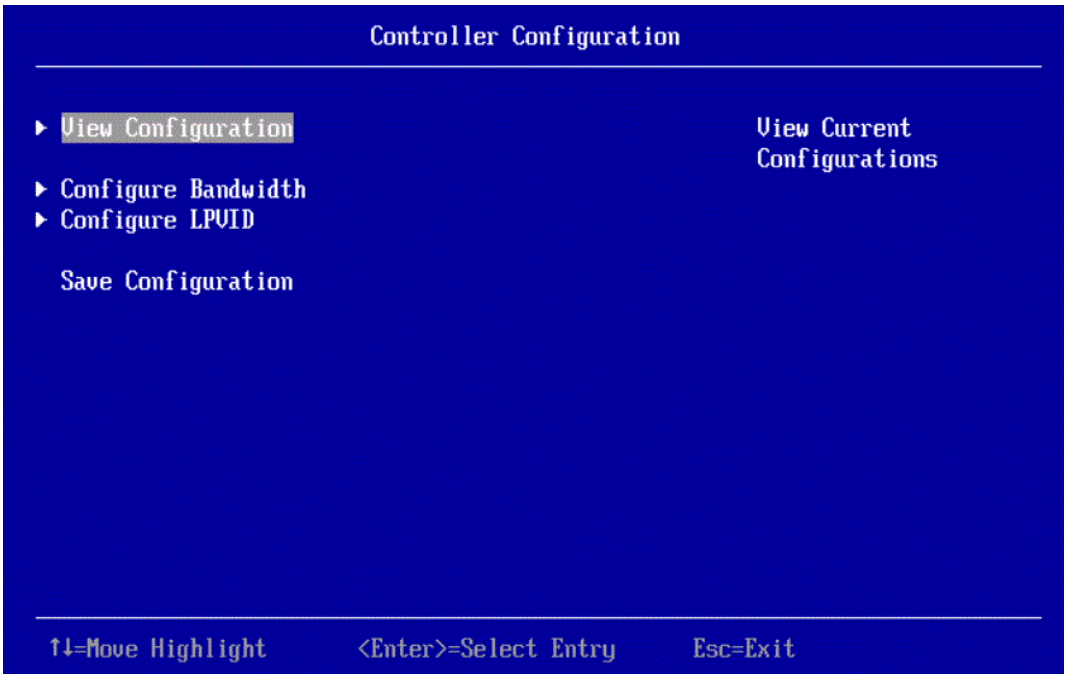

Figure 11-21 Switch Independent Mode Controller Configuration Screen

2. From the Controller Configuration screen, you can perform the following tasks:
   - View the current configuration of each function – see "Viewing the Configuration" on page 155.
   - Configure the minimum and maximum bandwidth percentage – see "Configuring Minimum and Maximum Bandwidth" on page 156.
   - Configure the LPVID per function – see "Configuring the LPVID" on page 157.

     Note: An LPVID is required for every function when using Switch Independent Mode, but it is optional for IBM Virtual Fabric Mode and IBM Unified Fabric Protocol Mode.

   - Save the current configuration – see "Saving the Configuration" on page 158.

Port Management

Note: The Port Management functionality is only available on IBM NIC adapters, and the configuration menu is only available on port 0.

The Port Management option is used to enable or disable the physical ports.

When port 0 is disabled, it brings down the physical link for port 0 and the power consumption of the adapter is lowered; however, the PCI functions associated with that port must remain enabled.

When any other port is disabled, all of the corresponding functions associated with that port are disabled and removed from the PCI configuration space. Disabling these ports also lowers the power consumption of the adapter.

Enabling any of the ports restores the previously removed PCI functions and restores the power consumption back to its normal state.

Note: Enabling and disabling ports is applicable in both multichannel and non-multichannel configurations. If multichannel is enabled, all virtual functions associated with the disabled port will also be disabled.

To configure port management:

1. On the Controller Configuration screen, select **Port Management** and press **<Enter>**. The Port Management screen appears.

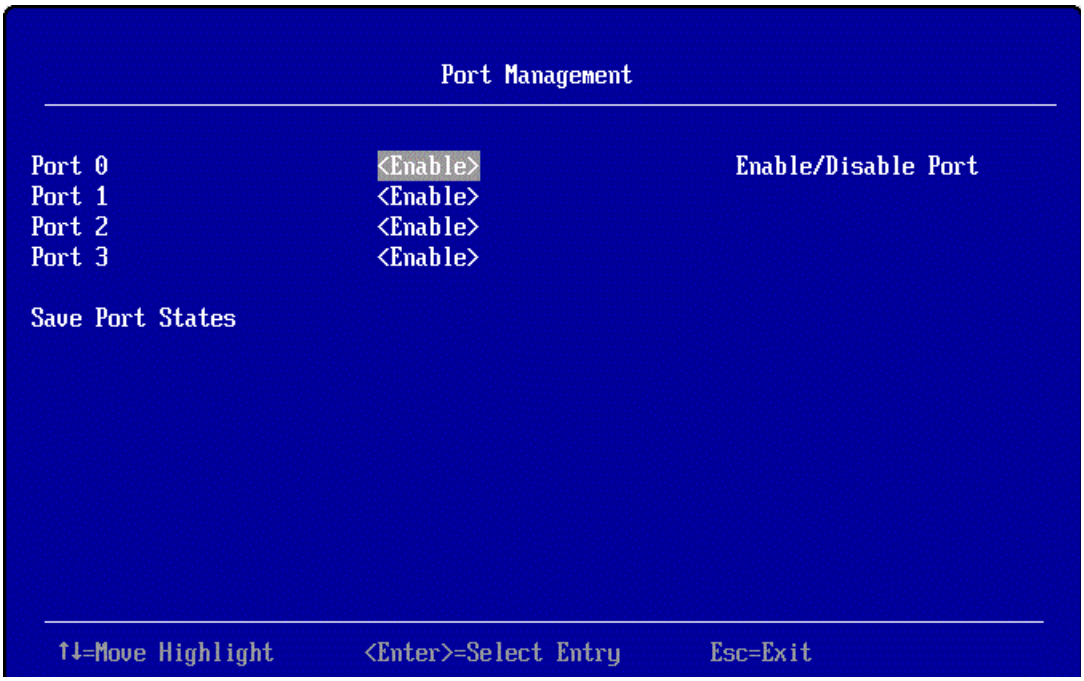

Figure 11-22 Port Management Screen

2. Select the current setting for a particular port and a pop-up menu appears.
3. Select **Enable** or **Disable** and press **<Enter>**.
4. When you are finished, select **Save Port States** to save the current settings.

5. Press **<Esc>** to return to the Controller Configuration screen.

Note: A reboot is required for this setting to take effect.

Feature on Demand

Note: The Feature on Demand functionality is only available on some IBM adapters.

FoD is an IBM proprietary protocol that enables storage functions on Emulex adapters. This feature requires a unique license key to be applied from IBM's IMM. For additional information on obtaining a license key, contact your IBM representative.

The FoD Type and FUI fields are required by IBM to generate a unique license key for the specific adapter for which you have requested a license. Each controller in the system should obtain its own license key.

To view Feature on Demand information, from the Emulex NIC Selection screen, select **Feature On Demand** and press **<Enter>**. The Feature On Demand screen appears.

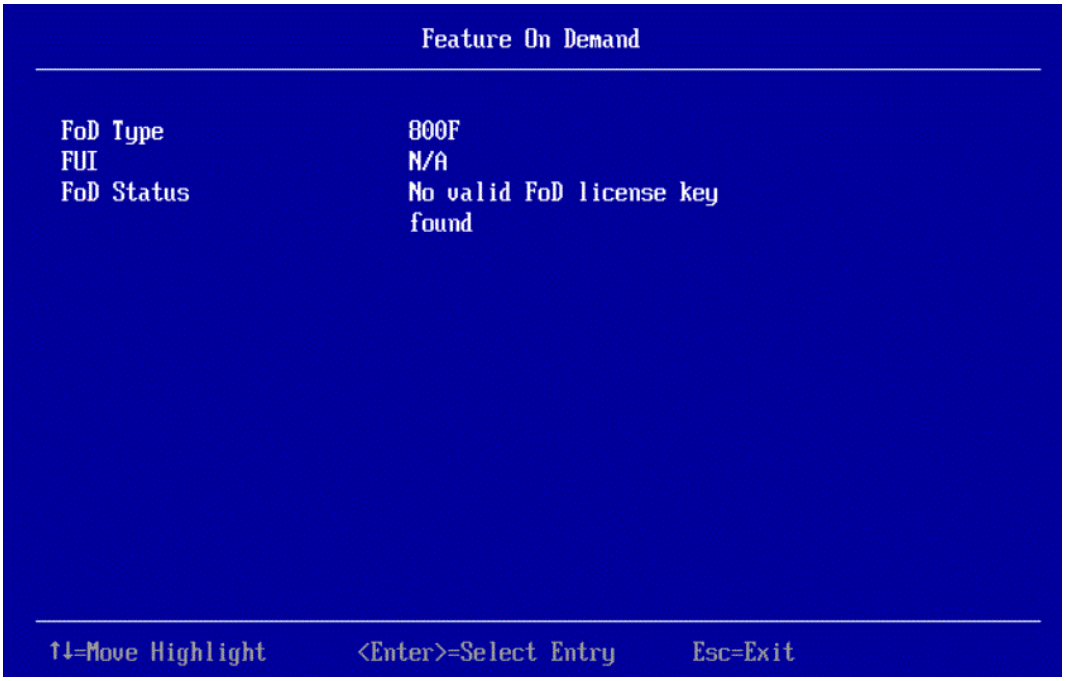

Figure 11-23 Feature On Demand Screen

From the Feature On Demand screen, you can view information on the feature type, the FoD Unique Identifier, and its current status.

FoD Type: The FoD Type field is unique for each platform. Different products have different FoD types. For example, LOM products have a different FoD type than mezzanine cards.

FUI: The FUI field is internally generated by the Emulex firmware using the FoD type and the adapter's serial number. The FUI is unique to each adapter because each card will have its own unique serial number.

FoD Status: The FoD Status field indicates whether a license key has been applied properly or not.

- When the FoD status field is set to "Enabled", it indicates that the FoD license key has been successfully applied and FoD is enabled. When FoD is enabled, you will see all of the storage personalities under the Personality menu option, including NIC, iSCSI, and FCOE.
- In all other cases, the FoD Status field indicates that a failure has occurred or that an FoD license has not been applied.

Downloading Firmware and Boot Code

A single firmware image contains the latest version of the firmware and boot code.

The ELX UNDI driver implements the PXE UNDI API services used by the SNP driver during PXE boot and while executing an NBP. The boot hardware abstraction layer (HAL) provides the OneConnect IOCTL interface API for the UNDI driver.

The firmware and UEFI NIC, iSCSI, and FCoE drivers are contained in one image file with the .UFI extension. This file must be flashed through the NIC interface exposed by HII.

To view the adapter's current firmware and boot code version, follow the steps in "Starting the Emulex NIC Configuration Utility" on page 135.

The Emulex NIC Selection screen displays the current firmware version for the selected adapter and a link to the Emulex Flash Update Utility, which you can use to download firmware and boot code.

To download firmware and boot code:

1. In an open UEFI shell, copy the firmware and boot code file into a directory on the EFI partition media.

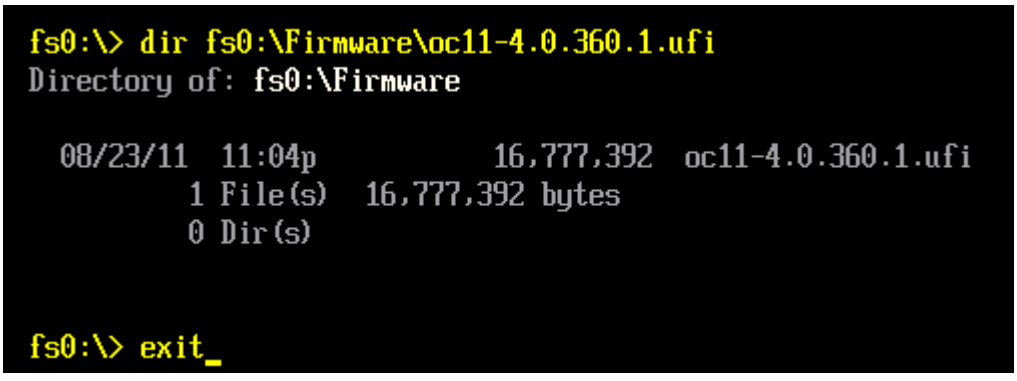

Figure 11-24 UEFI Shell with Firmware and Boot Code File

2. Exit the UEFI shell and launch the Emulex NIC configuration utility.
3. From the Network device list, select the NIC adapter you want to modify and press **<Enter>**.
4. The Emulex NIC Selection screen (Figure 11-1) shows information for the selected adapter. Select **Emulex Flash Update Utility** and press **<Enter>**. The Emulex Flash

Update Utility screen is displayed. This utility displays all available media and installs the flash file on the adapter.

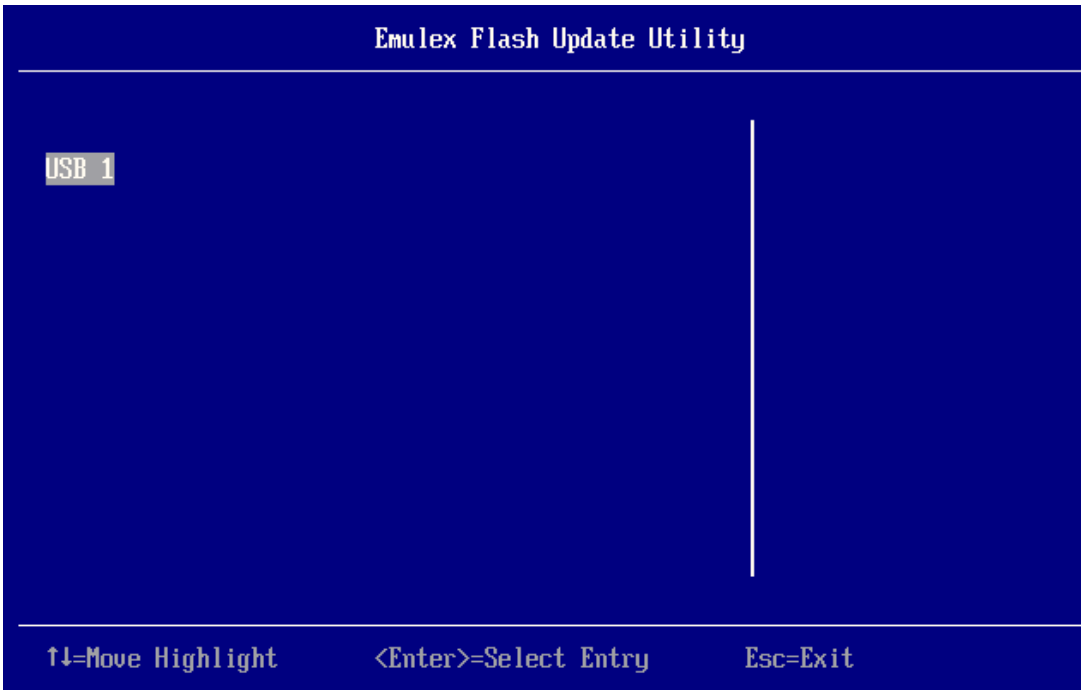

Figure 11-25 Emulex Flash Update Utility

5. Press **<Enter>** to select the media containing the flash file.

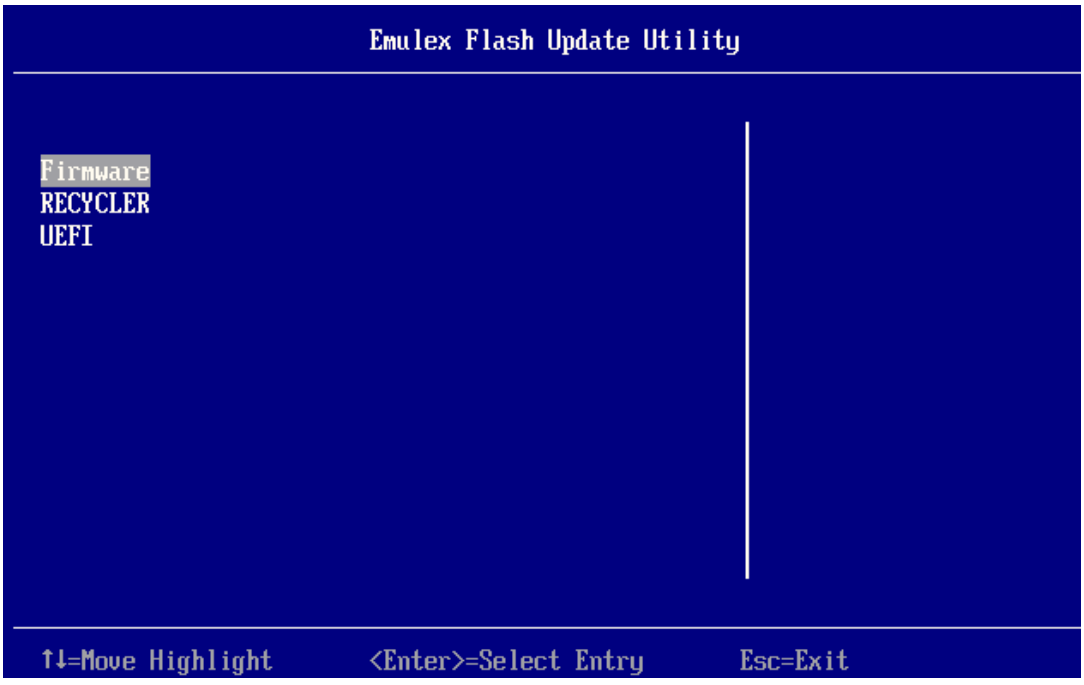

Figure 11-26 Emulex Flash Update Utility with Directory Name Dialog Box

6. Navigate to the directory containing the flash file and press **<Enter>**.

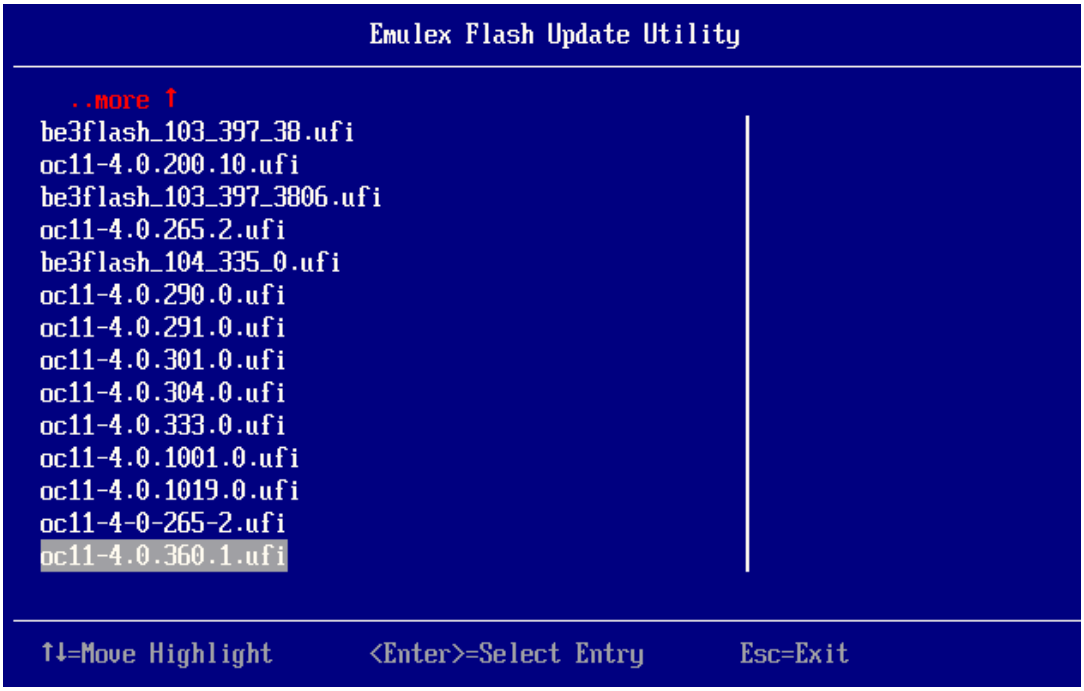

Figure 11-27 Emulex Flash Update Utility with Flash File Name Dialog Box

7. Use the arrow keys to select the flash file and press **<Enter>** to begin the update process. It takes about two minutes to complete.

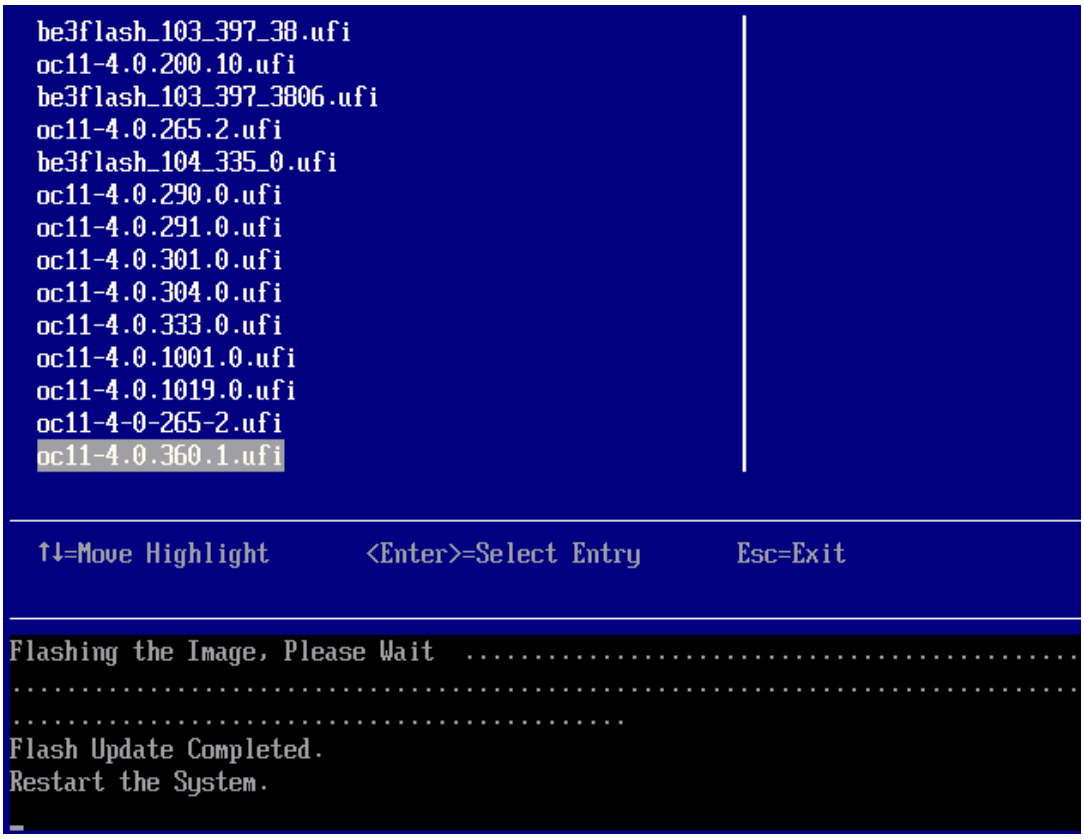

Figure 11-28 Emulex Flash Update Utility, Flash Updating

Note: This firmware flash procedure only flashes the physical interface which was selected in the HII menu. All Emulex adapters must contain the same firmware version to function properly. The above procedure should be repeated for each physical interface installed in the system before proceeding to the next step.

8. Reset the system. The latest version information for the adapter is displayed in the Emulex NIC Selection screen (Figure 11-1).

Identifying a Port

To physically identify a port on the Emulex NIC Selection screen, select **Port Identification** and press **<Enter>**. The LEDs on your controller start blinking indicating the selected port.

Note: Not all controllers have LEDs that are visible externally. If you are using an add-in card in a blade server environment, the port identification or beaconing capability does not work.

Note: If port identification is not supported on your system, you will receive a message stating that it is not supported.

Erasing Ports and Controller Configuration

Note: When selecting this setting, all previous configuration settings are returned to their factory default settings except for the current personality selection. Emulex recommends performing this action to provide a clean environment for new configuration settings to take effect.

To erase ports and the controller configuration:

1. On the Emulex NIC Selection Screen, select **Erase Configuration** and press **<Enter>**.

   A warning appears asking if you want to erase the configurations for both ports of the controller.

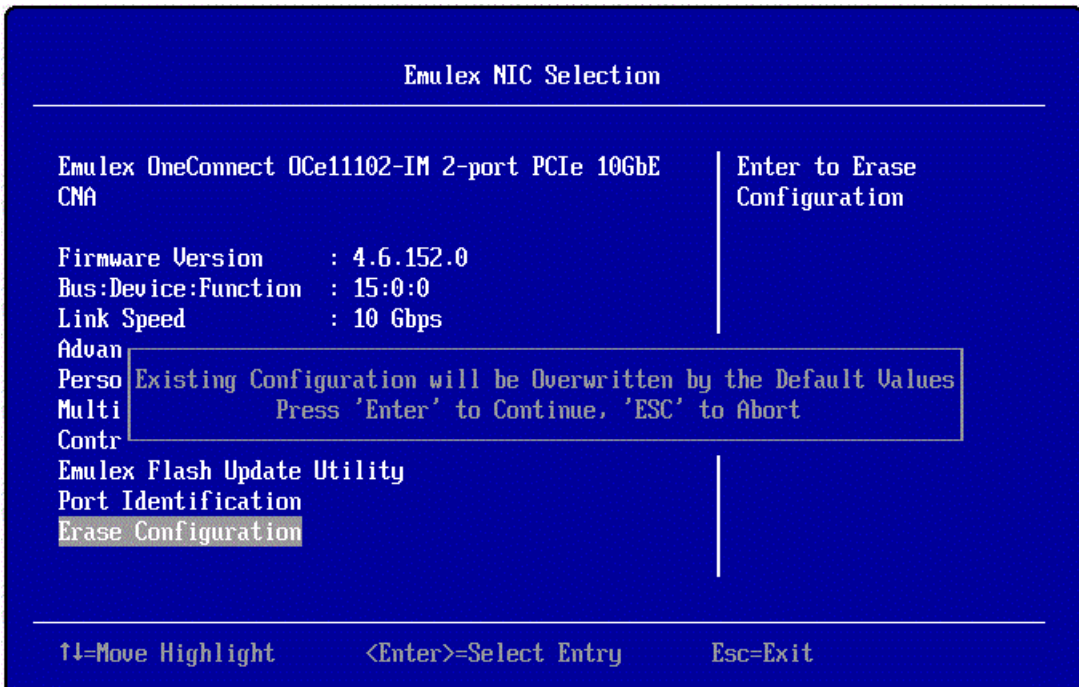

Figure 11-29 Erase Configuration Screen

2. Press **<Enter>** to delete the controller configuration, or press **<Esc>** to abort the operation.

UEFI NIC Diagnostics

The UEFI NIC driver diagnostics protocol can be used to run diagnostic tests on each NIC function of the card. This protocol is used by a platform management utility to allow you to run driver specific diagnostics on a controller.

EFI_DRIVER_DIAGNOSTICS_PROTOCOL

Syntax:

```
drvdiag [-c] [-l XXX] [-s] [-e] [-m] [driverhandle [devicehandle
[childhandle]]]
```

Description:

The UEFI NIC driver diagnostics protocol can be used to run diagnostic tests on each NIC function of the card. Diagnostics can be run in standard mode, extended mode, and manufacturing mode.

Parameters:

`-c`	Diagnose all child devices.
`-1 XXX`	Diagnose using the ISO 639-2 language specified by XXX.
`-s`	Run diagnostics in standard mode. Diagnostics in standard mode run the LED test, Link test, Get MAC test, and the DMA test (Read, Write, and Read and Write)
`-e`	Run diagnostics in extended mode. Diagnostics in extended mode run the ARM Timer test, the MAC Loopback test, and the Physical Loopback test.
`-m`	Run diagnostics in manufacturing mode. Diagnostics in manufacturing mode run the Network Loopback test for the OCe10100-series adapters and the Low-level Subsystem NLB test for the OCe11100-series, OCe14000-series, and LPe16202/OCe15100 adapters.
`driverhandle`	Handle of the driver being configured.
`devicehandle`	Handle of a device that the driverhandle is managing.
`childhandle`	Handle of a device that is a child of the devicehandle.

Examples:

The following examples show you a way of using the EFI_DRIVER_DIAGNOSTICS_PROTOCOL.

The `driver` command identifies the handle of the driver:

```
Shell> drivers

   122 Emulex 10G NIC
```

The `drvdiag` command list all the devices available for diagnostics. Each Ctrl [XXX] corresponds to a NIC function, which may be physical or virtual. The command returns handles for NIC functions on both ports.

```
Shell> driverdiag

   Drv[122] Ctrl[121]
   Drv[122] Ctrl[123]
```

To run the standard diagnostic tests on function 0:

```
Shell> drvdiag -s 122 121
```

To run the standard diagnostic tests on all NIC functions:

```
Shell> drvdiag -s 122
```

12. Configuring UEFI for iSCSI

Note: For systems with multiple adapters, the UEFI system firmware or boot code uses the highest version driver installed on any of the adapters. Adapters with older versions of EFIBoot are managed by the more recent version, but only as long as the adapter with the most recent version is in the system. The latest firmware and boot code must be installed on each adapter in the system to ensure that each adapter runs the latest firmware and boot code.

Overview

UEFIBoot supports:

- EFI protocols – Configuration and component name are supported.
- Operating systems – Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, RHEL 6.x and newer, and SLES 11 SP2 and newer
- Multi-Device path – SCSI device path is selectable through the driver configuration protocol.
- Multi-initiators – Up to 96 adapters in a system.
- Multi-target – 256 targets are selectable through the driver configuration protocol.
- Multi-LUNs – Up to 256 LUNs are supported.
- Multi-utility – Setup is supported.

This version of UEFIboot is loaded from flash into system memory.

When UEFIBoot is loaded in an EFI Shell, type "`drivers`" and press **<Enter>** to see if the driver is loaded.

Note: If you are using Dell adapters, refer to appendix F., "Dell UEFI," on page 271 for information on using the Dell UEFI utility.

Navigating the Emulex iSCSI Configuration Utility

The Emulex iSCSI configuration utility has menus and configuration screens. Use the following methods to navigate them:

- Press the up/down arrows on your keyboard to navigate menu options or configuration fields. When multiple adapters are listed, use the up/down arrows to scroll to the additional adapters.
- Press the **<+>**, **<->**, or **<Enter>** keys to change numeric values.
- Press **<Enter>** to select an option.
- Press **<Esc>** to exit the current screen and show the previous screen.

Starting the Emulex iSCSI Configuration Utility

Depending on the OEM UEFI configuration, the Emulex iSCSI configuration utility may appear under different setup menus in the OEM system firmware or BIOS (such as **Storage**).

To start the Emulex iSCSI configuration utility:

1. Select the **Emulex iSCSI Utility** for a particular function and press **<Enter>**.

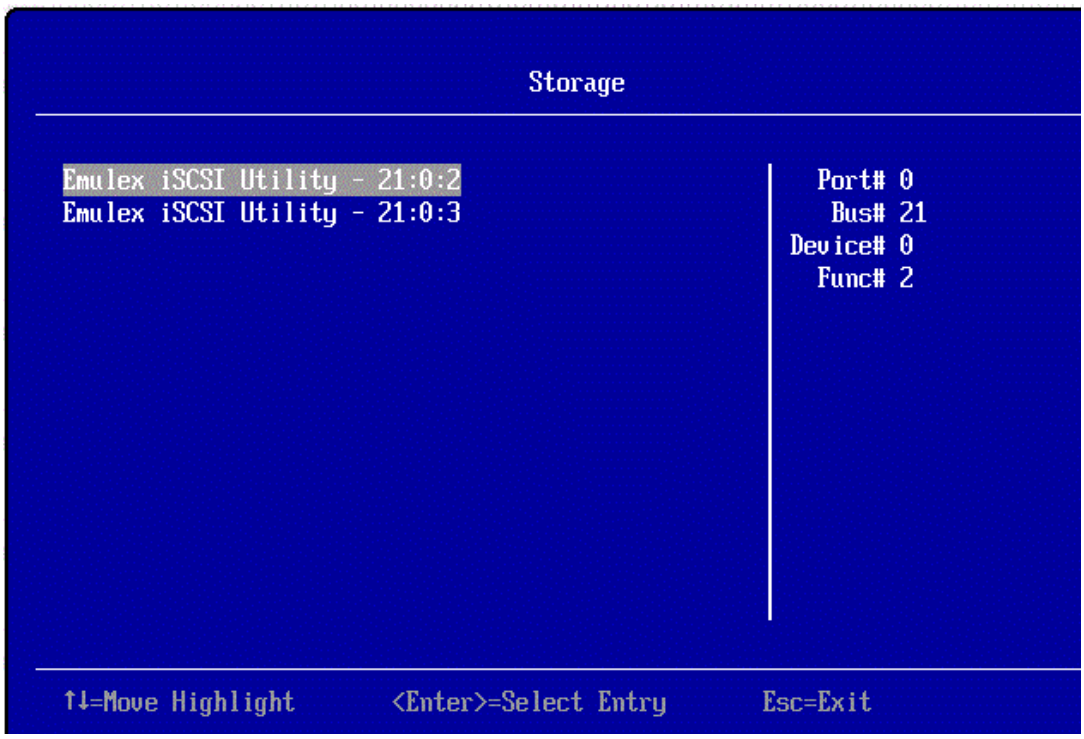

Figure 12-1 Storage Screen

The Controller Configuration Menu screen is displayed.

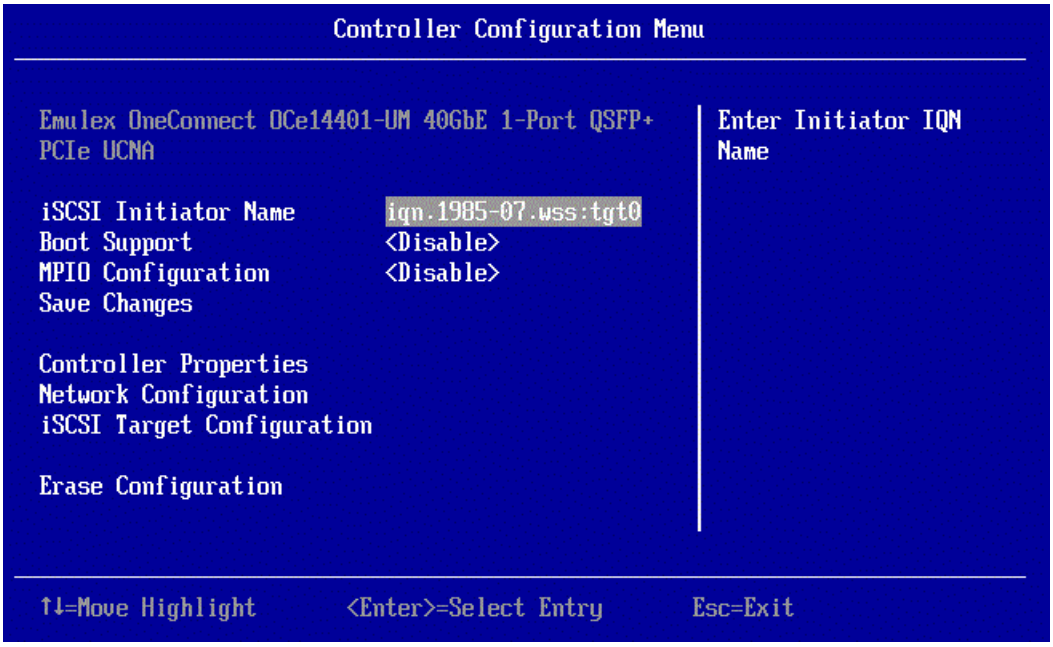

Figure 12-2 Controller Configuration Menu Screen

2. Highlight **iSCSI Initiator Name** and press **<Enter>** to edit the initiator name.

   This is a global setting. The initiator name configured on one adapter is reflected on all adapters in the system.

   Note: HP systems are an exception to the previous statement. Each port on an HP system can be configured with a unique initiator name.

3. To save changes, select **Save Changes** and press **<Enter>**.

Configuring MPIO

MPIO support allows the initiator to log in dual sessions to the same target. In this way I/O can be sent over either TCP/IP connection to the target. If one session fails another session can continue processing I/O without interruption to the application. In iSCSI target configuration, you have the option of setting dual network paths to a single boot LUN.

Note: Although MPIO boot support allows the initiator to log into multiple sessions, the iSCSI BIOS currently limits the number of sessions to two iSCSI sessions for a single boot LUN.

You must follow these steps in this order to configure MPIO boot support for each operating system.

1. Use the Emulex iSCSI configuration utility to configure the first path to a boot target.
2. Complete normal operating system installation.

3. Install third-party MPIO software for your operating system.
4. Configure the second path to a single boot LUN through the Emulex iSCSI configuration utility.

To configure MPIO:

1. From the Controller Configuration Menu screen, select **MPIO Configuration** and press **<Enter>**.

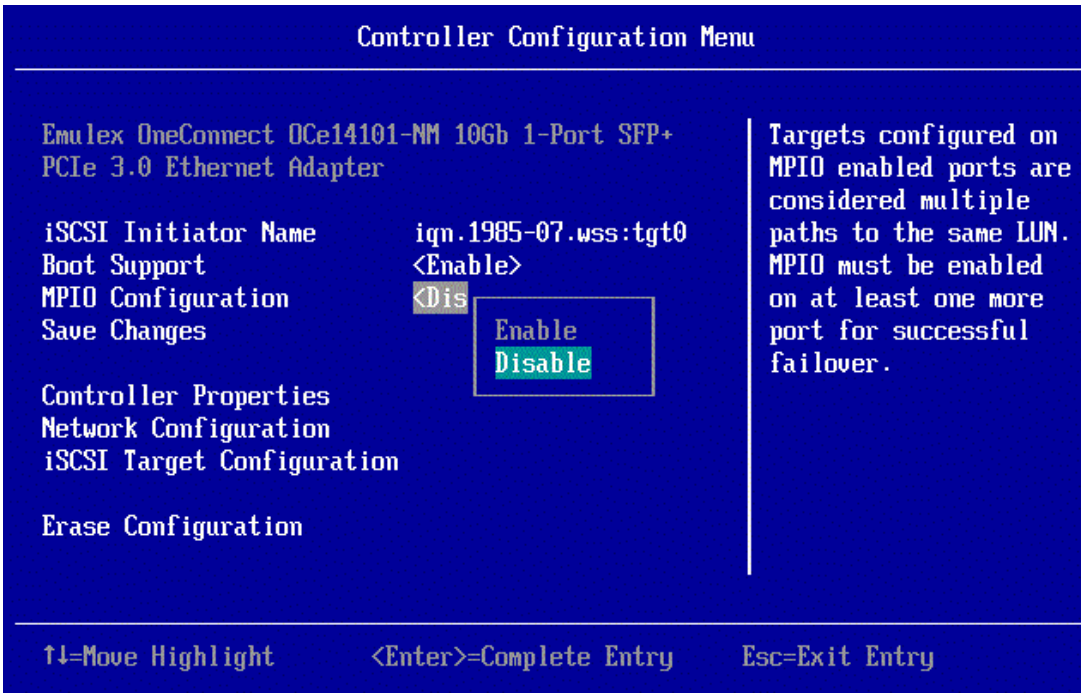

Figure 12-3 Controller Configuration Menu Screen with MPIO Configuration Setting Highlighted

2. From the MPIO Configuration pop-up menu, select **Enable** or **Disable** and press **<Enter>**.
3. To save your changes, select **Save Changes** and press **<Enter>**.

Configuring Boot Support

Boot support is provided for each port or function. If boot support is enabled, you can boot from the specified function. If boot support is disabled, you will not be able to boot from the function.

To configure boot support:

1. From the Storage screen (Figure 12-1), select the **Emulex iSCSI Utility** for a particular function and press **<Enter>**. The Controller Configuration Menu is displayed.

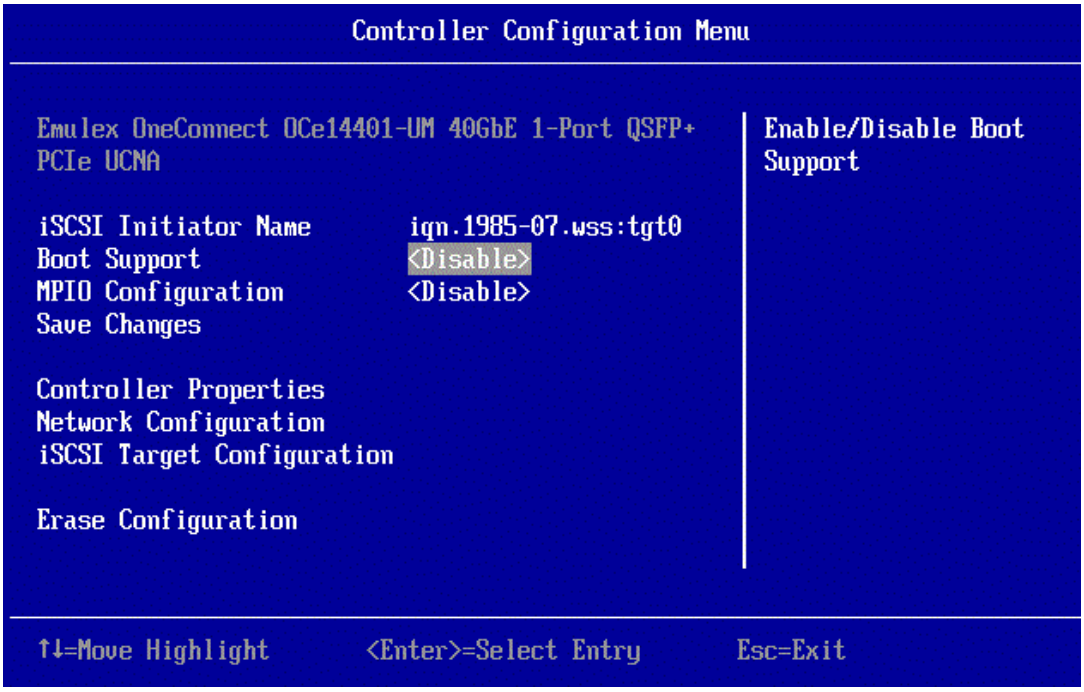

Figure 12-4 Controller Configuration Menu Screen with Boot Support Setting Highlighted

2. Select **Boot Support** and press **<Enter>**.
3. From the Boot Support pop-up menu, select **Enable** or **Disable** and press **<Enter>**.
4. To save your changes, select **Save Changes** and press **<Enter>**.

Viewing the Controller Properties

To view the controller properties:

1. From the Storage screen (Figure 12-1), select the **Emulex iSCSI Utility** for a particular function and press **<Enter>**. The Controller Configuration Menu is displayed (Figure 12-2).
2. From the Controller Configuration Menu screen, select **Controller Properties** and press **<Enter>**. The Controller Properties screen is displayed.

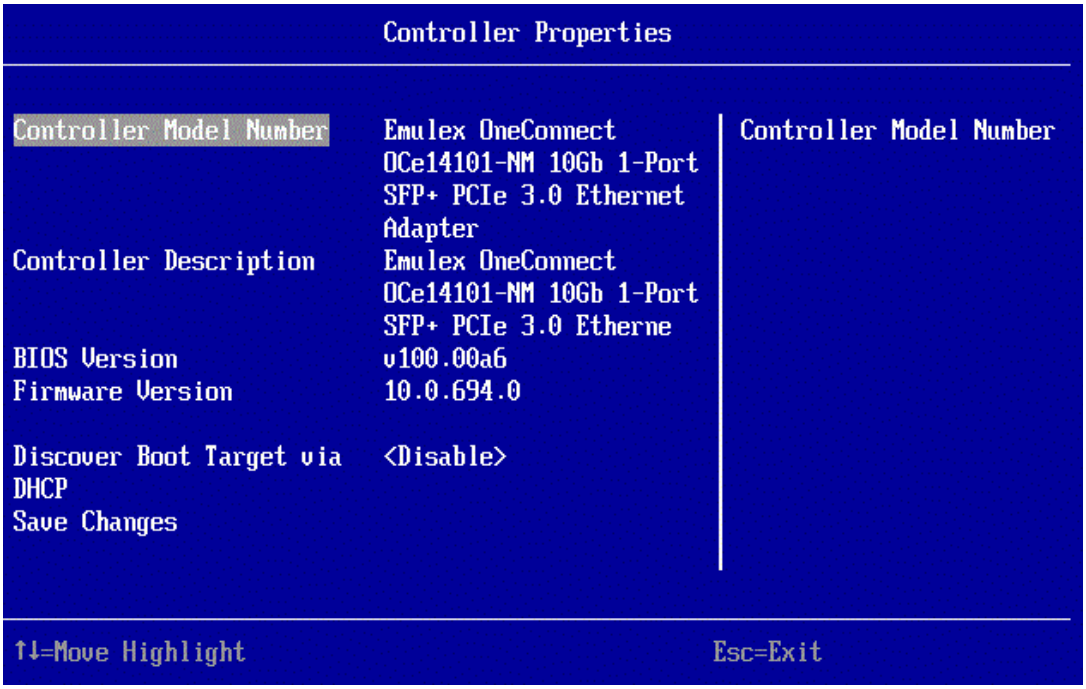

Figure 12-5 Controller Properties Screen

Configuring the Network

To configure the network:

1. From the Controller Configuration Menu screen (Figure 12-2), select **Network Configuration** and press **<Enter>**. The Network Configuration screen is displayed.

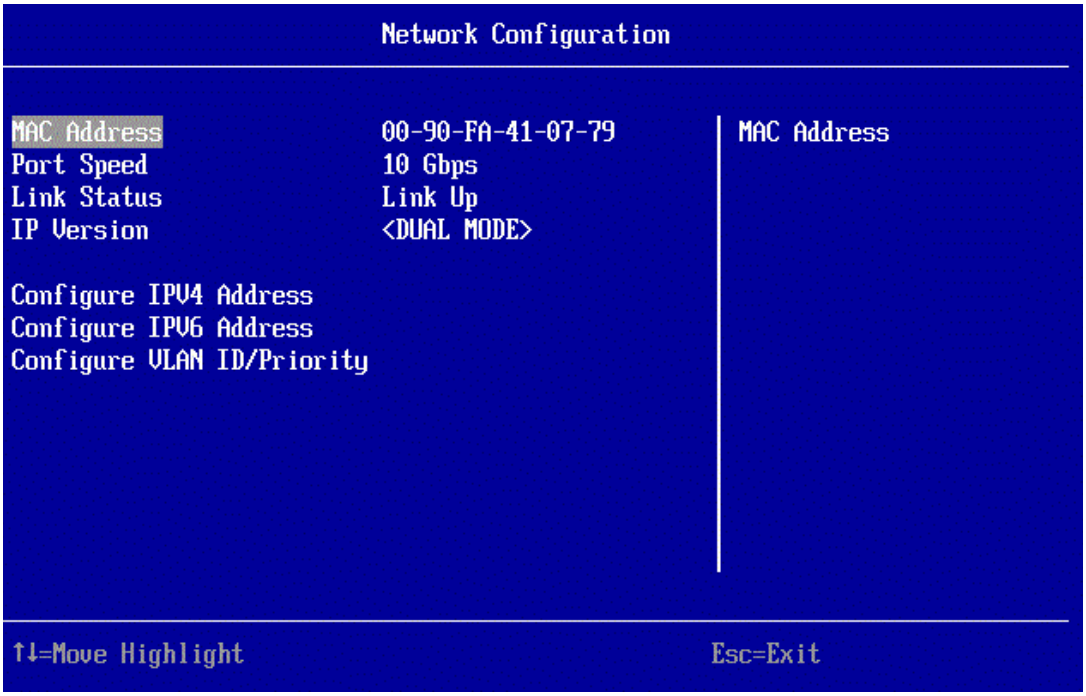

Figure 12-6 Network Configuration Screen

The Network Configuration screen displays the MAC address, port speed, and link status for the adapter. From the Network Configuration screen, you can configure the following items:

- IP version
- IPv4 address
- IPv6 address
- VLAN ID/priority

Configuring the IP Version

To configure the IP version:

1. On the Network Configuration screen (Figure 12-6), select **IP version** and press **<Enter>**.

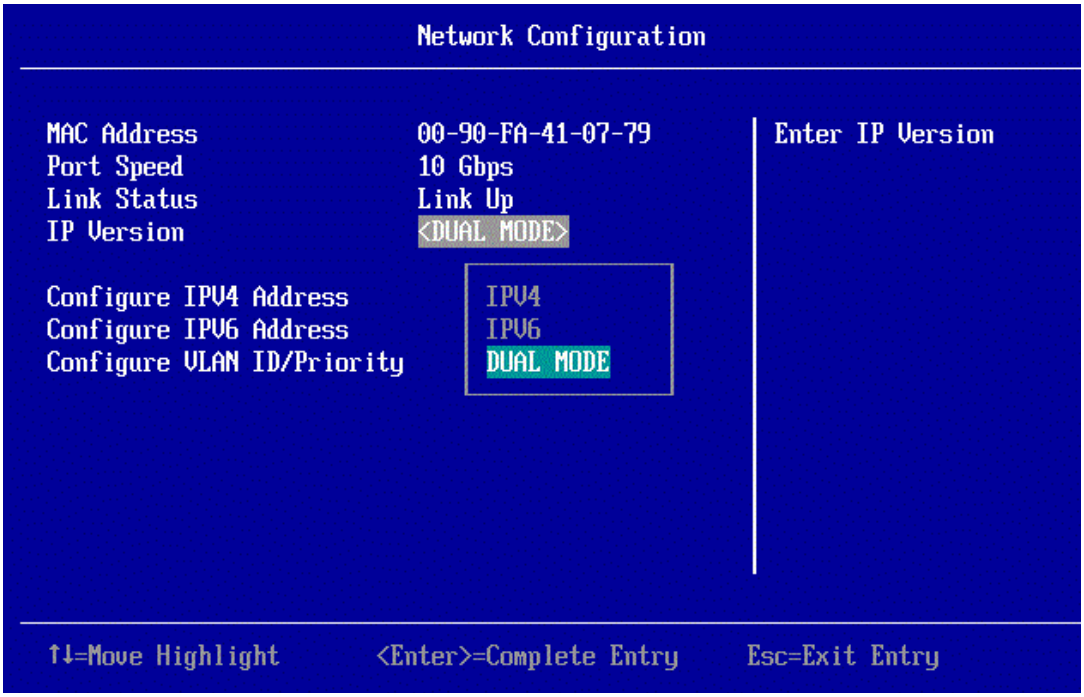

Figure 12-7 Network Configuration Menu Screen with IP Version Setting Highlighted

2. From the IP Version pop-up menu, select **IPV4**, **IPV6**, or **DUAL MODE** and press **<Enter>**.
3. To save your changes, select **Save Changes** and press **<Enter>**.

Configuring an IPV4 Address

To configure an IPv4 address:

1. On the Network Configuration screen (Figure 12-6), ensure the IP version is set to IPV4 or DUAL MODE.
2. Select **Configure IPV4 Address** and press **<Enter>**. The Configure IPV4 Address screen is displayed.

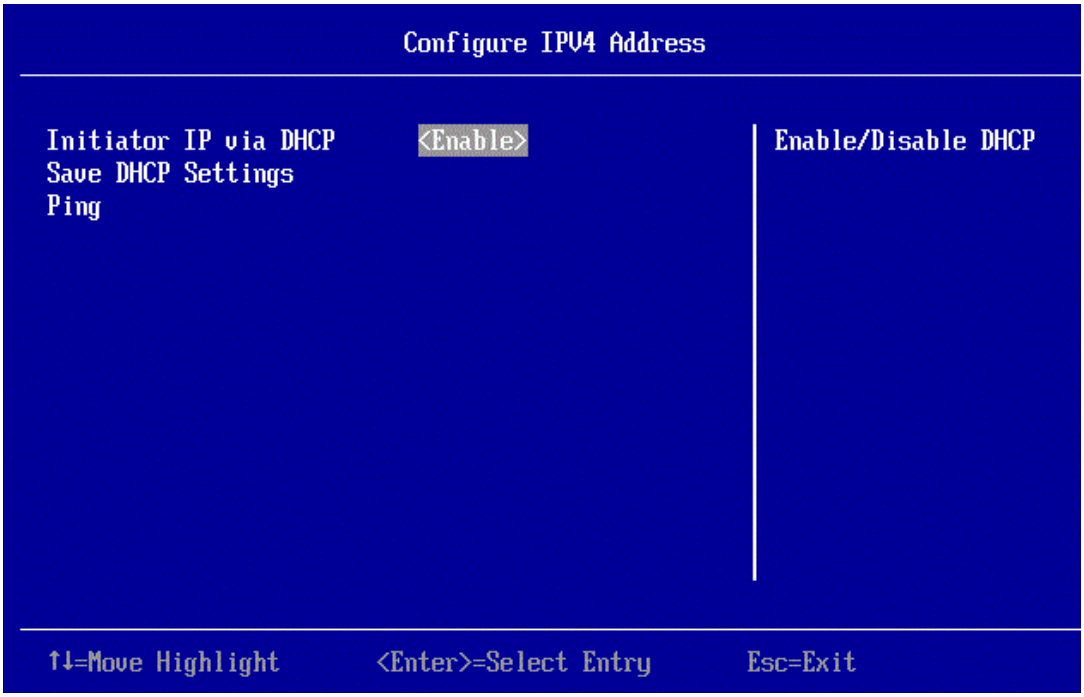

Figure 12-8 Configure IPV4 Address Screen

3. From the Configure IPV4 Address screen, you can do the following:
   - Enable DHCP for automatic assignment of the IP address through a DHCP server. See "Automatically Assigning an IP Address through a DHCP Server" on page 180 for more information.
   - Configure a static IP address (when Initiator IP via DHCP is disabled). See "Manually Assigning an IP Address" on page 181 for more information.
   - Ping the iSCSI initiator. See "Pinging the iSCSI Initiator" on page 181 for more information.

Automatically Assigning an IP Address through a DHCP Server

To enable DHCP for automatic assignment of the IP address through a DHCP server:

1. On the Configure IPV4 Address screen (Figure 12-8), select **Initiator IP via DHCP** and press **<Enter>**.
2. From the Initiator IP via DHCP pop-up menu, select **Enable** and press **<Enter>**.
3. Select **Save DHCP Settings** and press **<Enter>**.

Manually Assigning an IP Address

To manually assign an IP address:

1. On the Configure IPV4 Address screen (Figure 12-8), ensure that the Initiator IP via DHCP is set to **<Disable>**. If you change this setting from <Enable> to <Disable>, select **Save DHCP Settings** and press **<Enter>**.
2. Select **Configure Static IP Address** and press **<Enter>**. The Configure Static IP Address screen appears.

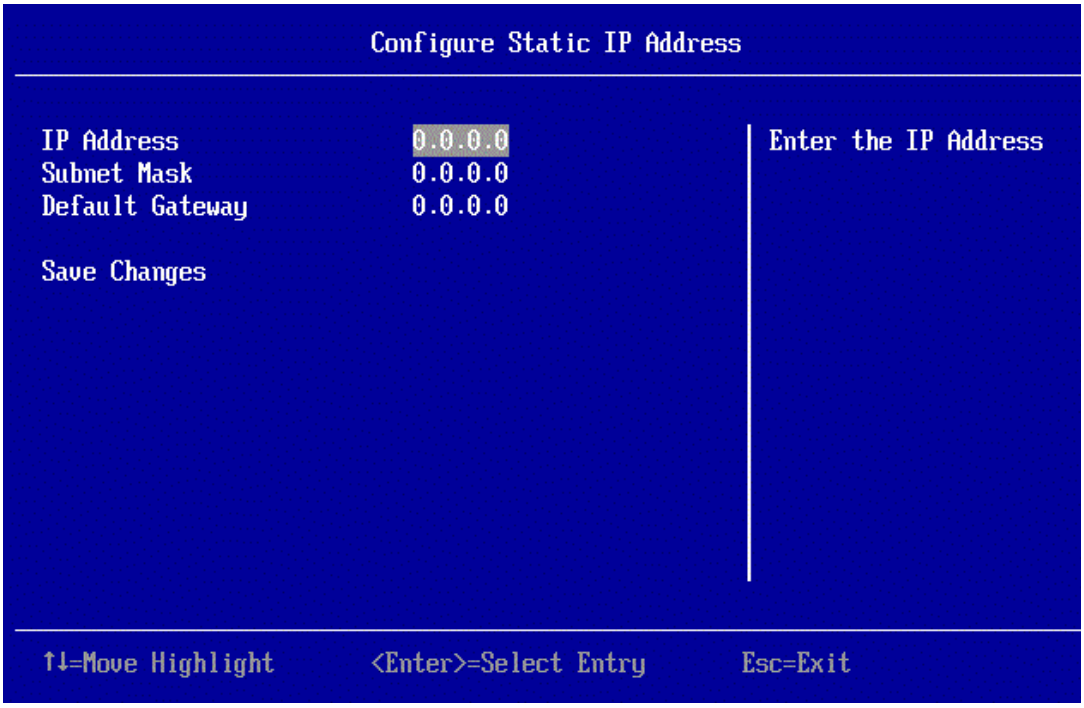

Figure 12-9 Configure Static IP Address Screen

3. Enter the IP address, subnet mask, and default gateway in the corresponding fields.
4. Select **Save Changes** and press **<Enter>**.

Pinging the iSCSI Initiator

To ping the iSCSI initiator, on the Configure IPV4 Address screen (Figure 12-8), select **Ping** and press **<Enter>**.

- If the ping is successful, a reply message is displayed with the iSCSI initiator IP address.
- If the ping is not successful, a failure message is displayed.

Configuring an IPV6 Address

To configure an IPv6 address:

1. On the Network Configuration screen (Figure 12-6), ensure the IP version is set to IPV6 or DUAL MODE.
2. Select **Configure IPV6 Address** and press **<Enter>**. The Configure IPV6 Address screen is displayed.

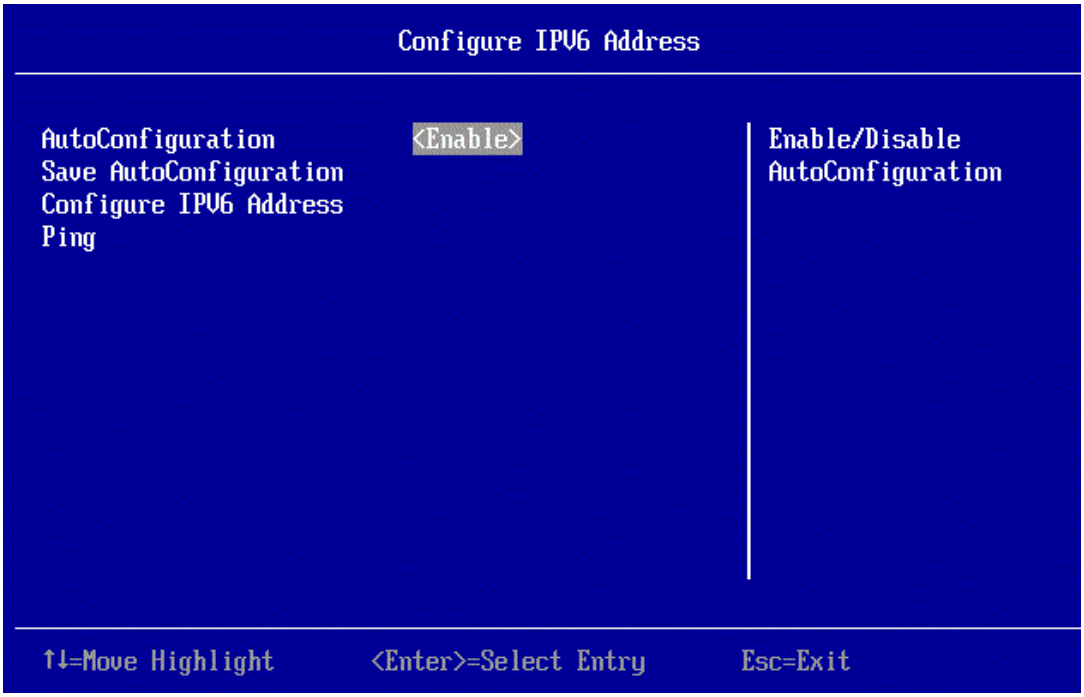

Figure 12-10 Configure IPV6 Address Screen

3. From the Configure IPV6 Address menu, you can do the following:
   - Enable automatic configuration of the IP address. See "Automatically Configure an IP Address" on page 182 for more information.
   - Configure the IPv6 address. See "Configuring the IPv6 Address" on page 183 for more information.
   - Ping the iSCSI initiator. See "Pinging the iSCSI Initiator" on page 183 for more information.

Automatically Configure an IP Address

To enable automatic IP address configuration:

1. On the Configure IPV6 Address screen (Figure 12-10), select **AutoConfiguration** and press **<Enter>**.
2. From the AutoConfiguration pop-up menu, select **Enable** and press **<Enter>**.
3. Select **Save AutoConfiguration** and press **<Enter>**.

Configuring the IPv6 Address

To configure the IPv6 address:

1. On the Configure IPV6 Address screen (Figure 12-10), select **Configure IPV6 Address** and press **<Enter>**. The Configure IPV6 Address screen appears.

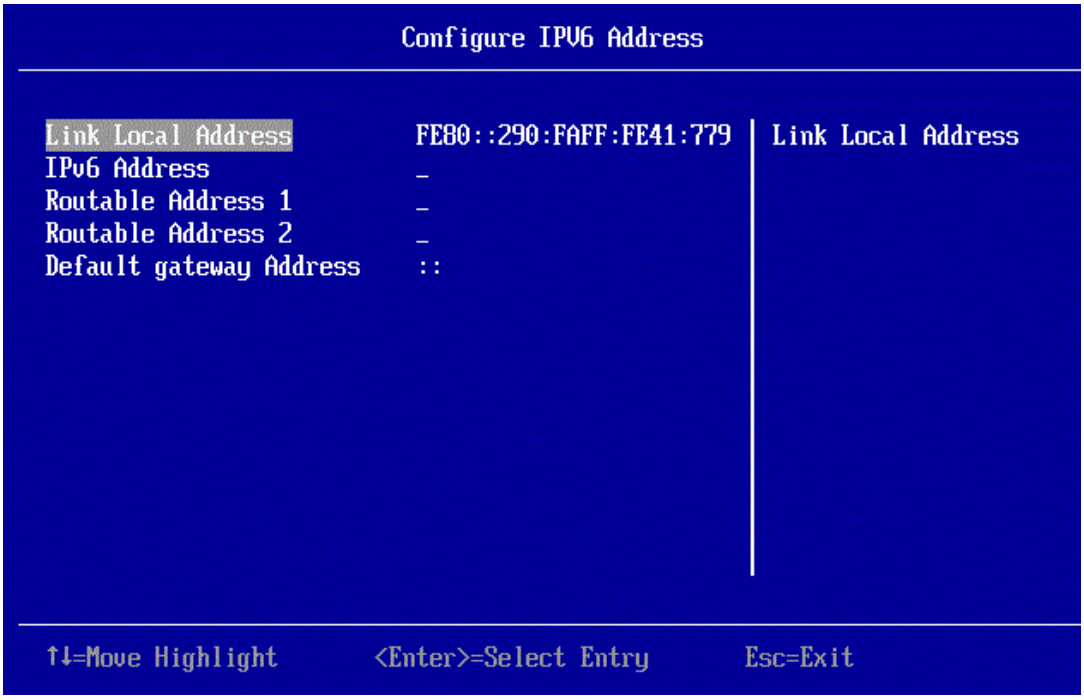

Figure 12-11 Configure IPV6 Address Settings Screen

2. Enter the link local address, IPv6 address, routable address 1, routable address 2, and default gateway address in the corresponding fields.
3. Press **<Esc>** to exit the menu.

Pinging the iSCSI Initiator

To ping the iSCSI initiator, on the Configure IPV6 Address screen (Figure 12-10), select **Ping** and press **<Enter>**.

- If the ping is successful, a reply message is displayed with the iSCSI initiator IP address.
- If the ping is not successful, a failure message is displayed.

Configuring VLAN ID/Priority

A VLAN is a way of partitioning the network. If the LAN is made up of all devices within a broadcast domain, a VLAN is a broadcast domain made up of switches. You first create a VLAN and then assign ports to a VLAN. All ports in a single VLAN are in a single broadcast domain.

You do not have to configure VLANs unless your network is already using them. Some reasons why VLANs are used include:

- A LAN increases in size with numerous devices.
- A LAN has extensive broadcast traffic on it.
- Groups of users on a LAN need more security.

A VLAN ID, like an IP address or initiator name, is assigned a value to uniquely identify it on a network. A VLAN priority is set to determine what packet gets priority order within a VLAN.

To configure a VLAN ID/priority:

1. On the Network Configuration menu (Figure 12-6), select **Configure VLAN ID/Priority** and press **<Enter>**. The Configure VLAN ID/Priority screen appears.

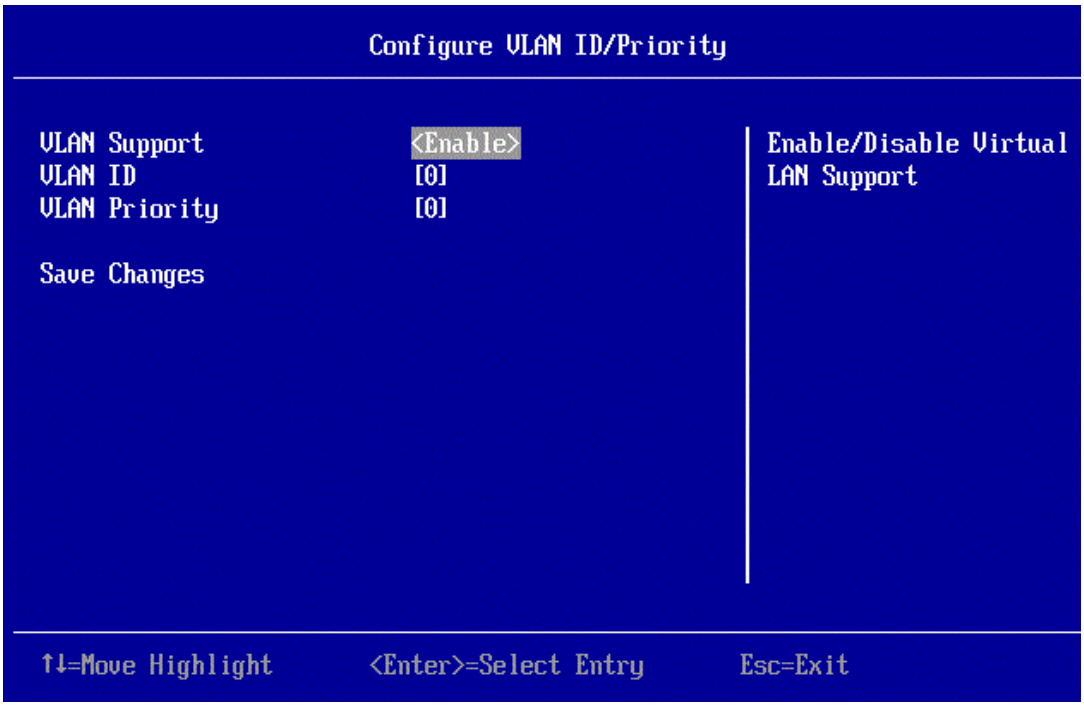

Figure 12-12 Configure VLAN/ID Priority Screen

2. To enable VLAN support:
   a. Select **VLAN Support** and press **<Enter>**.
   b. From the VLAN Support pop-up menu, select **Enable** and press **<Enter>**.
3. To assign a VLAN ID number:

a. Select **VLAN ID** and press **<Enter>**. This is a unique value you assign to each VLAN on a single device. There are a maximum of 4093 possible values ranging from 2-4094.
b. Enter a VLAN ID value and press **<Enter>**.

4. To set a VLAN priority, if necessary:
   a. Select **VLAN PRIORITY** and press **<Enter>**. This unique value assigns a priority to outbound packets containing a specified VLAN ID. Valid values range from 0-7, with 0 the highest priority level.
   b. Enter a VLAN priority value and press **<Enter>**.
5. Select **Save Changes** and press **<Enter>**.
6. Press **<Esc>** to return to the Network Configuration menu.

Updating Firmware

To update firmware, you must use the NIC firmware update utility which revises the iSCSI function with a single firmware download image. For more information on downloading firmware, see "Downloading Firmware and Boot Code" on page 165.

Adding and Configuring Targets

Once the initiator has been configured you need a process that shows you how to make an iSCSI target available to that initiator host. The discovery process presents an initiator with a list of available targets. The discovery methods used for discovering targets are:

- DHCP discovery
- SendTargets discovery
- Manually configuring targets

Before you begin the login session, gather the following information:

- iSCSI target name (only for manual configuration) – The target name that you are adding. The iSCSI target name is not required if you are using DHCP or SendTargets discovery. It is required only for manually configured targets. This name should be known to you based on how you configured your iSCSI target.
- iSCSI target IP address – The IP address of the target into which you are logging.
- TCP port number – The TCP port number of the target portal. Typically this is 3260, which is the well-known port number defined for use by iSCSI.

Discovering and Adding Boot Targets through DHCP

To automatically discover and add boot targets through DHCP:

1. On the Controller Properties screen (Figure 12-5), set **Discover Boot Target via DHCP** to **<Enable>** and press **<Enter>**.
2. Select **Save Changes** and press **<Enter>**.

3. Reboot the system.
4. On the Controller Configuration menu (Figure 12-2), select **iSCSI Target Configuration** and press **<Enter>**. The iSCSI Target Configuration screen shows the discovered targets.

   Note: For more information on configuring a DHCP boot target, refer to "Discovering Targets through DHCP for iSCSI" on page 131.

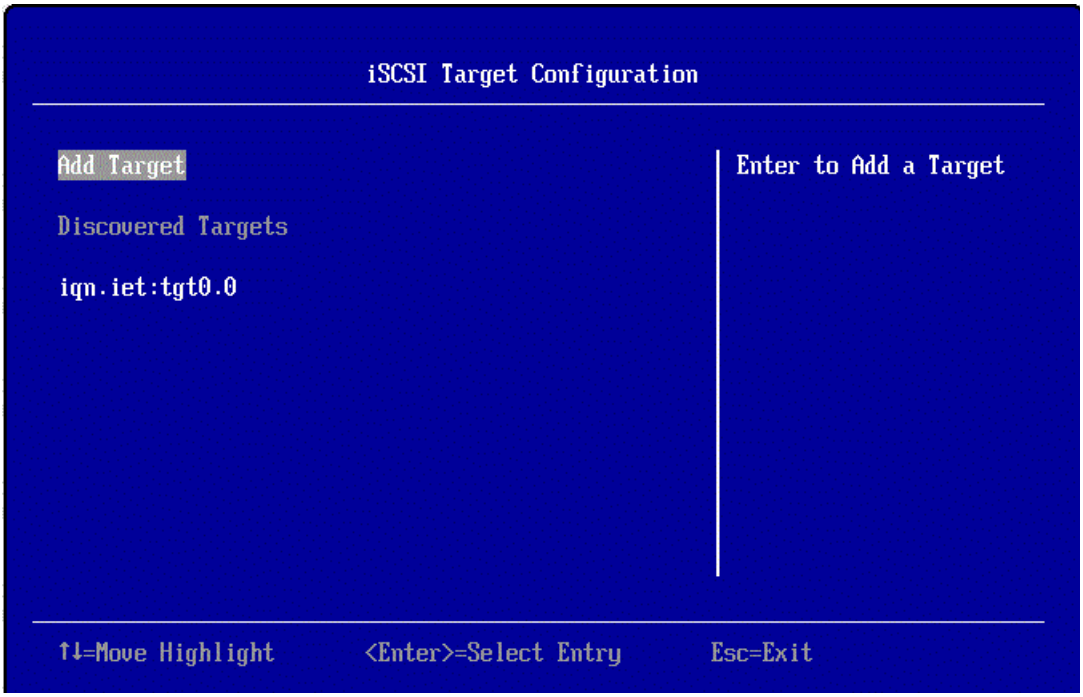

Figure 12-13 iSCSI Target Configuration Screen

Using SendTargets Discovery to Add an iSCSI Target

SendTargets discovery asks an iSCSI target to provide the list of target names that can be logged into by the initiator. The iSCSI initiator then uses the SendTargets Discovery option to perform the device discovery. Use this method if an iSCSI node has a large number of targets. When adding an iSCSI target, leave the iSCSI target name option blank, you can use the iSCSI SendTargets mechanism to add a target.

To configure an iSCSI target using the SendTargets discovery:

1. On the Controller Properties screen (Figure 12-5), set **Discover Boot Target via DHCP** to **<Disable>** and press **<Enter>**.
2. Select **Save Changes** and press **<Enter>**.
3. Reboot the system.
4. From the Controller Configuration Menu screen (Figure 12-2), select **iSCSI Target Configuration** and press **<Enter>**.
5. Select **Add Target** and press **<Enter>**.
6. In the Add/Ping iSCSI Target dialog box, leave the iSCSI Target Name blank for a SendTargets response.

Note: Only the first 64 sessions are returned during a single discovery session.

7. Enter the iSCSI target IP address.
8. Change the TCP port number value, if necessary. The default target port number is 3260.
9. Change the ISID qualifier value, if necessary. A unique ISID value is necessary if you connect dual sessions to the same target portal group. Enter a number up to 65535.
10. For a boot target, accept the default (None), even if you want to enable the target as a boot target.

    Note: You must enable the Boot Target option after you add the target via SendTargets (see step 16).

11. Select **Yes** from the Header Digest pop-up menu if you want to enable header digest. When set to Yes, and the iSCSI initiator is set accordingly, the integrity of an iSCSI PDU's header segment is protected by CRC32C checksum. The default setting is No.
12. Select **Yes** from the Data Digest pop-up menu if you want to enable Data Digest. When set to Yes, and the iSCSI initiator is set accordingly, the integrity of an iSCSI PDU's data segment is protected by CRC32C checksum. The default setting is No.
13. Select an authentication method (optional). If you are enabling an authentication method, you are prompted to enter CHAP configuration.
14. Select **Save/Login**. A message reminds you that you have left the iSCSI Target name blank and that the SendTargets mechanism will be used. If you want to continue, press **<Y>**.
15. After you send your SendTargets request to the target, the iSCSI Target Configuration screen appears with a list of targets. From this list of targets specify which targets to add.

    To do this, select the target or targets you want to add from the menu and press the space bar. After you have selected your targets, you can add these targets to the list of iSCSI targets available for the initiator to login. To do this, select **Save Target** and press **<Enter>**. If you enabled CHAP Authentication, you are prompted to enter CHAP configuration for each target, one at a time.

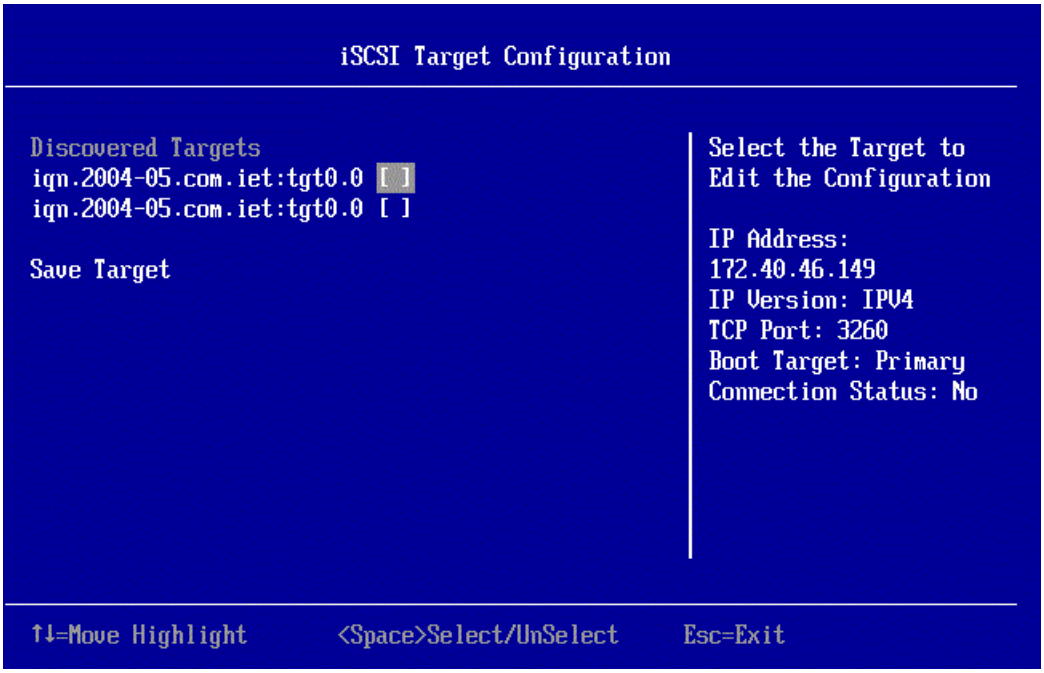

Figure 12-14 Discovered Targets Screen

16. After you have added your targets, from the Controller Configuration menu, select **iSCSI Target Configuration** and press **<Enter>** to view the added target information.

    Note: If you set the Boot Target option in step 5 before adding the target, the Boot Target displays No on this menu. To enable Boot Target, proceed to step 17.

17. To enable Boot Target or make any other changes to your target or targets, select the target and press **<Enter>**. The Edit/Ping iSCSI Target menu is displayed. From this menu, you can edit your target.

Manually Adding, Discovering, and Managing Boot Targets

To manually add and discover boot targets:

1. On the Controller Properties screen (Figure 12-5), set **Discover Boot Target via DHCP** to **<Disable>** and press **<Enter>**.
2. Select **Save Changes** and press **<Enter>**.
3. Reboot the system.

4. On the iSCSI Target Configuration screen, select **Add Targets** and press **<Enter>**. The Add/Ping iSCSI Target screen is displayed.

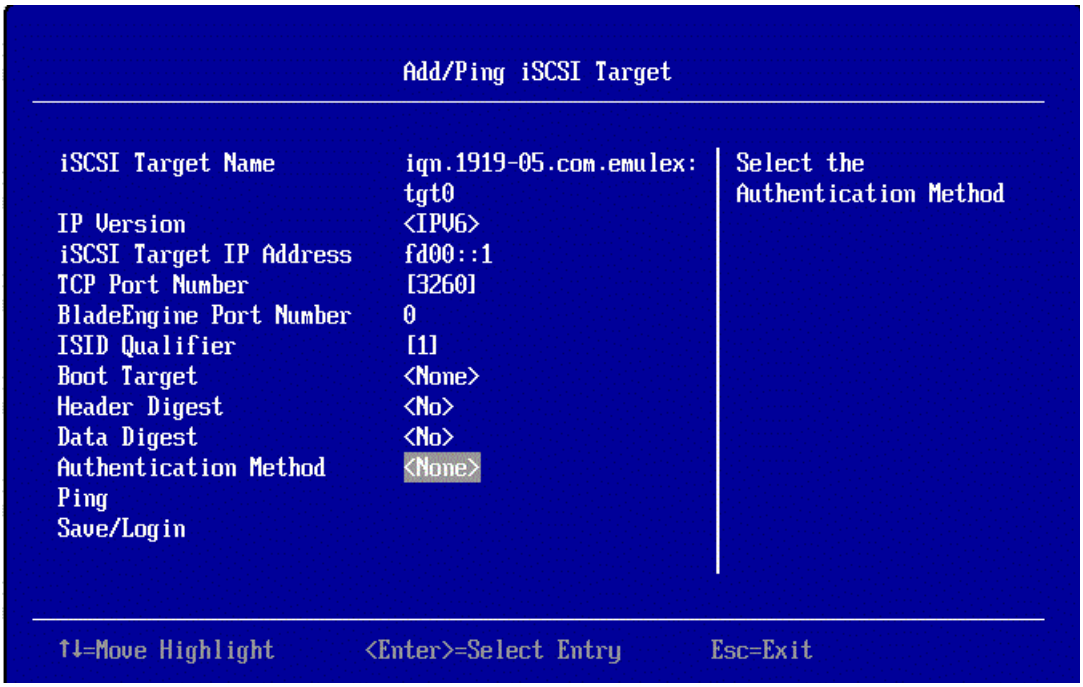

Figure 12-15 Add/Ping iSCSI Target Screen

5. Enter the target IP address and TCP port number (the default target port number is 3260).
6. Change the ISID qualifier value, if necessary. A unique ISID value is necessary if you connect dual sessions to the same target portal group. Enter a number up to 65535. For more information, see “Setting an ISID Value” on page 125.
7. For a boot target, use the default setting (No), even if you want to enable the target as a boot target. For more information about the boot target, see “Setting a Boot Target” on page 190.
8. Select **Yes** from the Header Digest pop-up menu if you want to enable header digest. When set to Yes, and the iSCSI initiator is set accordingly, the integrity of an iSCSI PDU’s header segment is protected by the CRC32C checksum. The default setting is No.
9. Select **Yes**, from the Data Digest pop-up menu if you want to enable Data Digest. When set to Yes, and the iSCSI initiator is set accordingly, the integrity of an iSCSI PDU’s data segment is protected by the CRC32C checksum. The default setting is No.
10. Select an authentication method (optional). If you are enabling an Authentication method, you are prompted to enter CHAP configuration. For more information about the authentication method, see “Selecting an Authentication Method” on page 191.
11. Select **Save/Login** and press **<Enter>** to discover targets.

Setting a Boot Target

The discovered target must be set as a boot target to enable iSCSI boot.

To set a boot target:

1. On the iSCSI Target Configuration screen, select the target name and press **<Enter>**. The Edit/Ping Target screen is displayed.

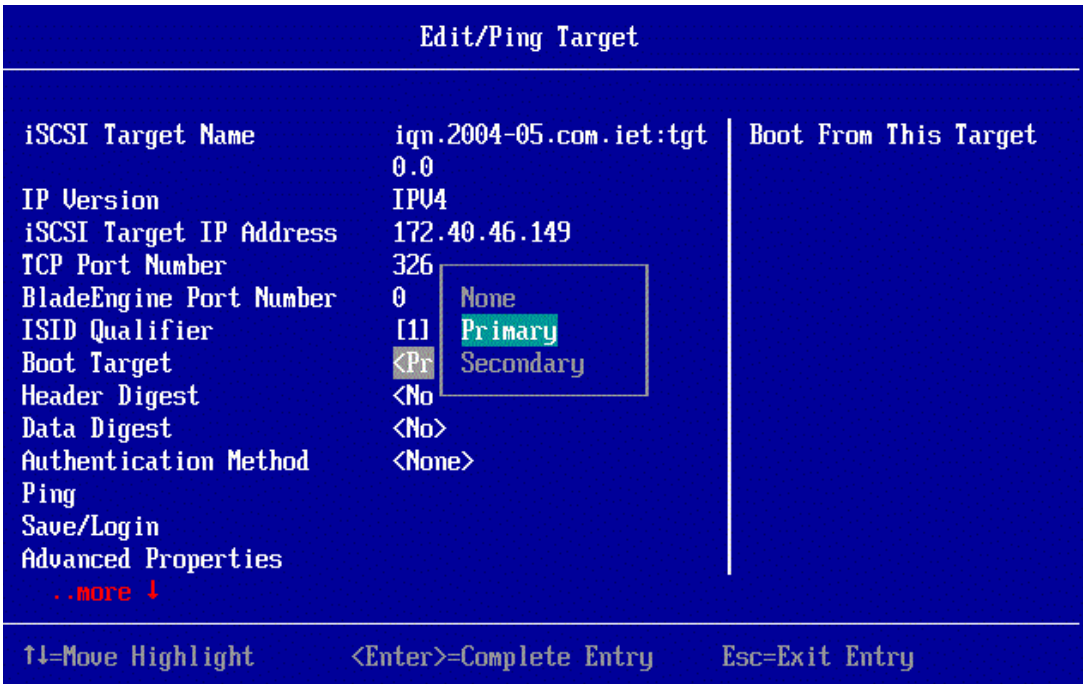

Figure 12-16 Boot Target Option on the Edit/Ping Target Screen

2. Select the **Boot Target** option and press **<Enter>**.
3. Select **Primary** or **Secondary** from the pop-up menu and press **<Enter>**.
4. Select **Save/Login** and press **<Enter>**.

Selecting an Authentication Method

The Emulex iSCSI configuration utility uses CHAP to authenticate initiators and targets for added network security. By using a challenge/response security mechanism, CHAP periodically verifies the initiator's identity. This authentication method depends on a secret known only to the initiator and the target. Although the authentication can be one-way, you can negotiate CHAP in both directions with the help of the same secret set for mutual authentication. You must make sure however, that what you configure on the target side, matches the initiator side. The Emulex iSCSI configuration utility supports both one-way and mutual authentication.

To configure the CHAP authentication method:

1. On the iSCSI Target Configuration screen, select the target name and press **<Enter>**. The Edit/Ping Target screen is displayed.

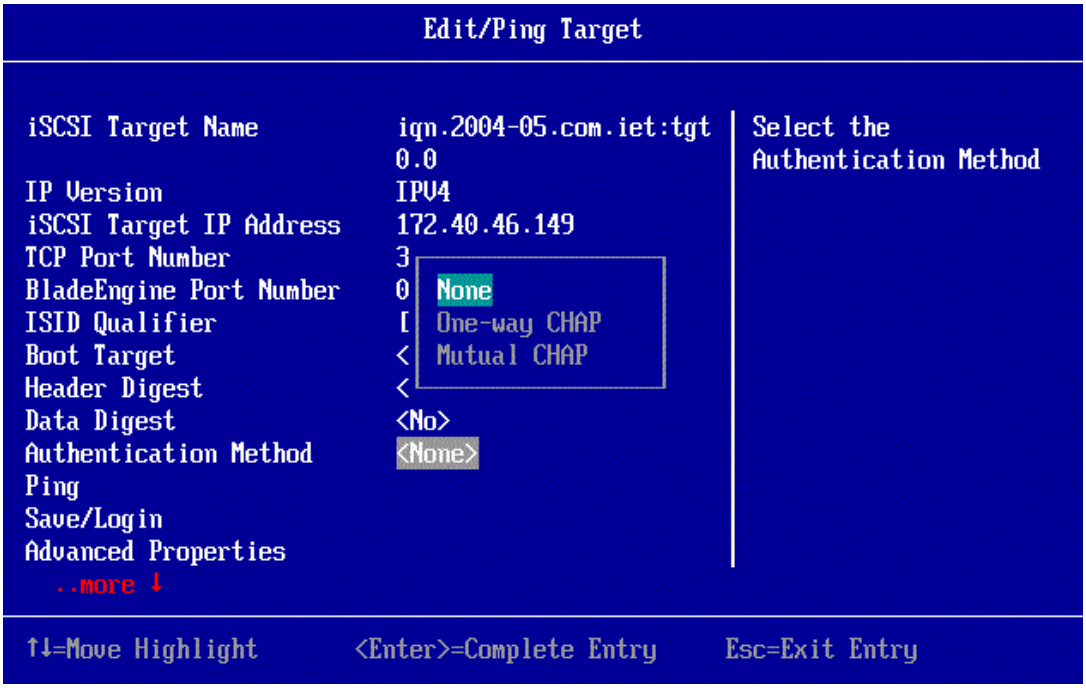

Figure 12-17 Authentication Method Option on the Edit/Ping Target Screen

2. Select the **Authentication Method** option and press **<Enter>**.
3. Select **None**, **One-way CHAP**, or **Mutual CHAP** from the pop-up menu and press **<Enter>**.
   - One-way CHAP – With one-way CHAP authentication, the target authenticates the initiator. Use one-way CHAP authentication for a one-way challenge/response security method – you must configure the username and password (secret), which is authenticated by the target.
   - Mutual CHAP – With mutual CHAP authentication, the target authenticates the initiator and the initiator authenticates the target. Use mutual CHAP authentication for a two-way challenge/response security method – you must configure different CHAP and mutual CHAP usernames and passwords.

Note: When you configure the CHAP parameters, verify that those parameters match the parameters on the storage side.

4. Select **Save/Login** and press **<Enter>**.

Pinging a Target

Note: If you want to verify that you can connect to a target before you log in, you must ping the target before you configure the target on the Edit/Ping Target screen.

To ping a target:

1. On the iSCSI Target Configuration screen, select the target name and press **<Enter>**. The Edit/Ping Target screen is displayed.

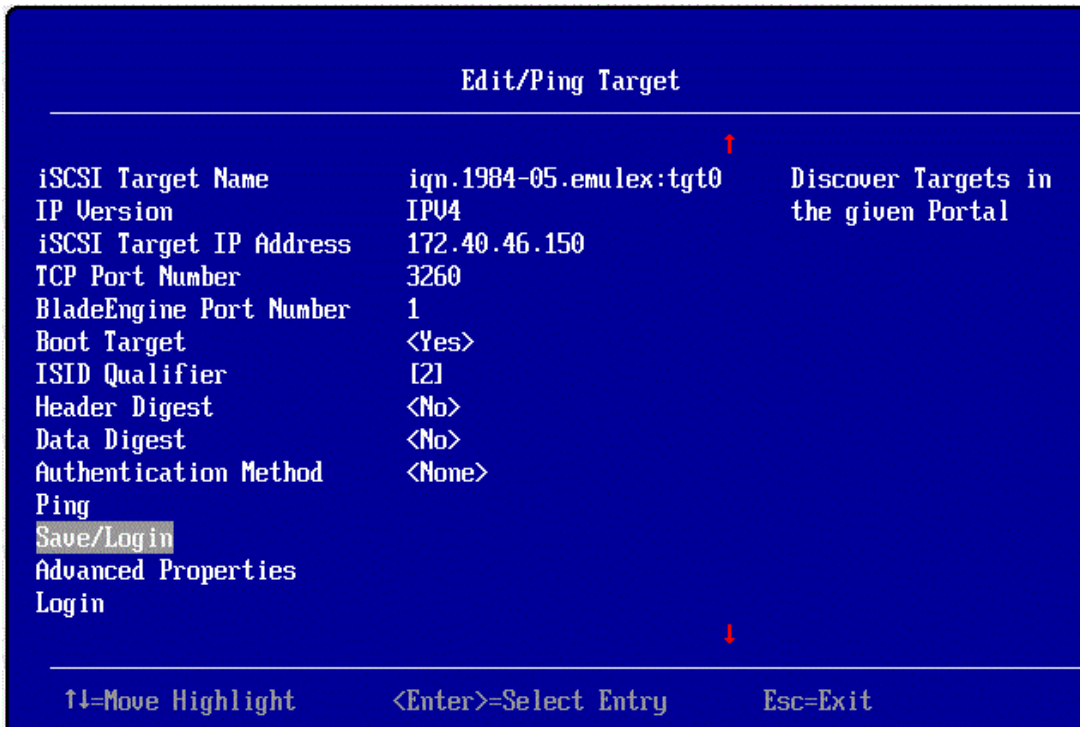

Figure 12-18 Edit/Ping Target Screen

2. From the Add/Ping iSCSI Target screen or the Edit/Ping Target screen, select **Ping** and press **<Enter>**. If the ping is successful, a screen similar to the following is displayed.

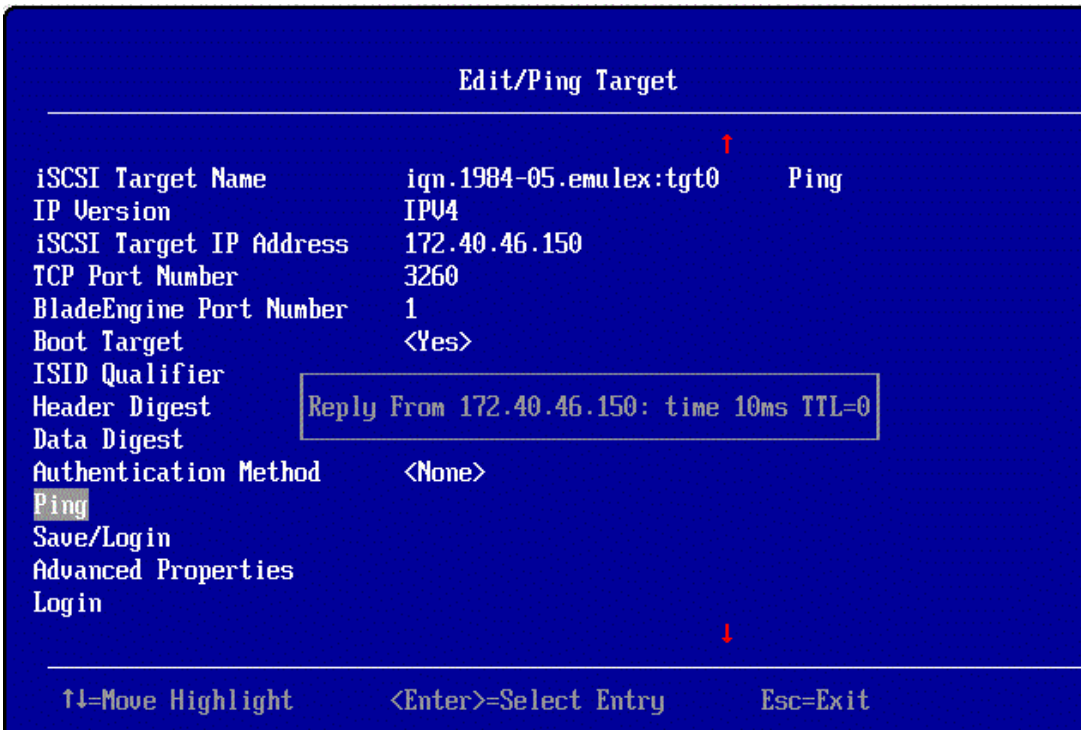

Figure 12-19 Successful Target Ping

If the ping is not successful, a failure message is displayed.

Viewing Advanced Properties

To view advanced properties:

1. On the Edit/Ping Target screen (Figure 12-18), select **Advanced Properties** and press **<Enter>**. The Advanced iSCSI Target Information screen is displayed.

Note: You may need to select **..more** to display additional configuration options.

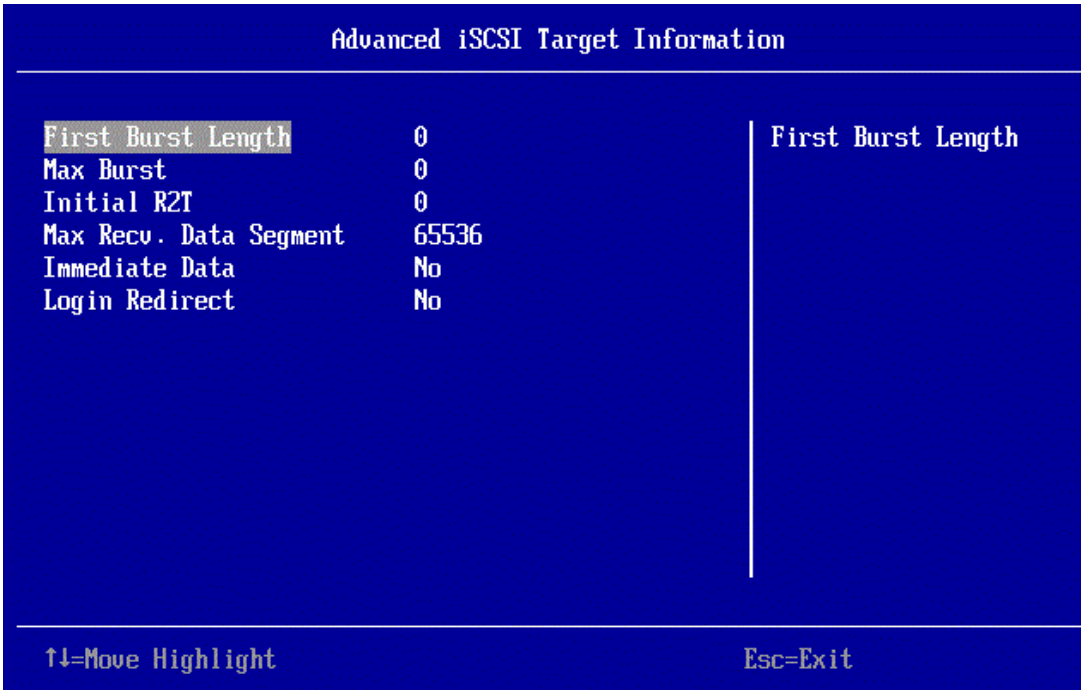

Figure 12-20 Advanced iSCSI Target Information Screen

Logging In or Logging Out of a Target

To log in or out of a target:

1. On the Edit/Ping Target screen (Figure 12-18), select **Login** or **Logout** to explicitly log in or log out of a target, and then press **<Enter>**.

   Note: You may need to select **..more** to display additional configuration options.

Deleting a Target

A target can be deleted only if it is not a boot target.

If a target is set as a boot target:

1. On the Edit/Ping Target screen (Figure 12-18), select **Boot Target** and press **<Enter>**.
2. From the pop-up menu, select **No** and press **<Enter>**.
3. Select **Save/Login** and press **<Enter>**.

To delete the target:

1. On the Edit/Ping Target screen, select **..more** to display additional configuration options.
2. Select **Delete Target** and press **<Enter>**.

Configuring LUNs

To configure LUNs:

1. On the Edit/Ping Target screen (Figure 12-18), select **LUN Configuration** and press **<Enter>**. The LUN Configuration screen is displayed.

   Note: You may need to select **..more** to display additional configuration options.

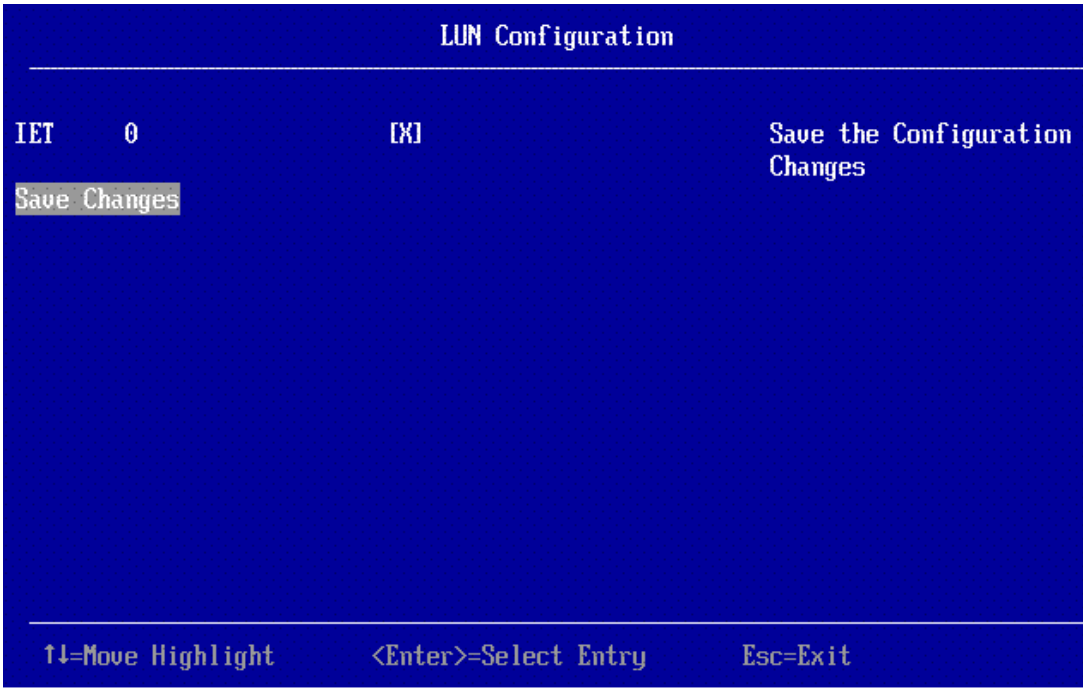

Figure 12-21 LUN Configuration Screen

2. If the target is a boot target, select any single LUN as a boot LUN using the **<Space>** bar.

   Note: If the target is not a boot target, you cannot select any LUNs.

3. Select **Save Changes** and press **<Enter>**.

iSNS Configuration

Note: This functionality is only available on UEFI-capable HP adapters.

The Internet Storage Name Service (iSNS) Protocol allows automated discovery, management and configuration of iSCSI and FC devices (using iFCP gateways) on a TCP/IP network.

To view the iSNS Configuration screen:

1. On the Controller Configuration menu (Figure 12-2), select **iSCSI Target Configuration** and press **<Enter>**.

Figure 12-22 iSCSI Target Configuration Screen

2. On the iSCSI Target Configuration screen, select **iSNS Configuration** and press **<Enter>**. The iSNS Configuration screen is displayed.

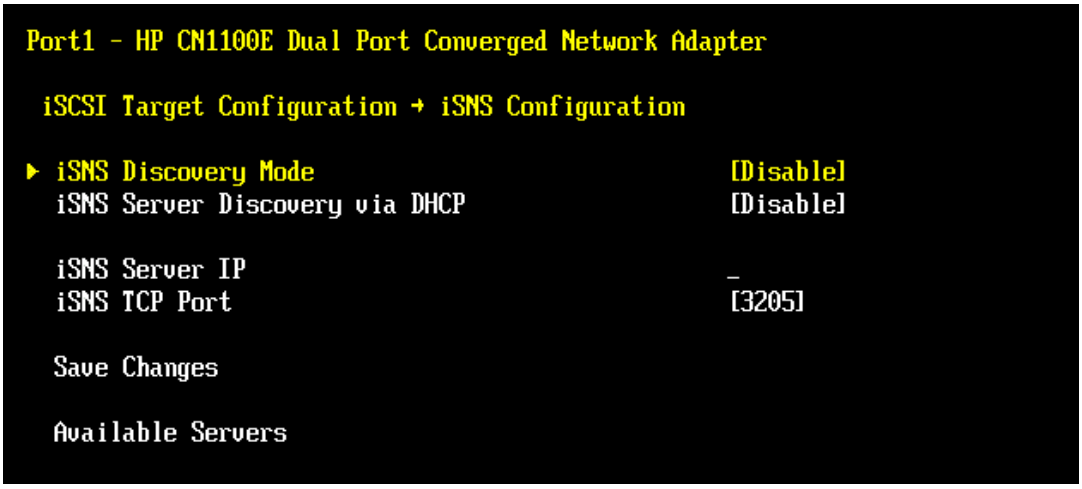
Port1 - HP CN1100E Dual Port Converged Network Adapter
iSCSI Target Configuration → iSNS Configuration
iSNS Discovery Mode [Disable]
iSNS Server Discovery via DHCP [Disable]
iSNS Server IP
iSNS TCP Port [3205]
Save Changes
Available Servers

Figure 12-23 iSNS Configuration Screen

The iSNS Configuration screen enables you to perform the following tasks:

- Enable or disable iSNS discovery mode
- Enable or disable iSNS server discovery via DHCP
- Configure the iSNS server IP address and TCP port number manually
- Save any changes made to the iSNS configuration
- View a list of available iSNS servers

Enabling iSNS Discovery

This option enables or disables iSNS discovery. iSNS targets are only discovered when this option is enabled.

To enable or disable iSNS discovery:

1. From the iSNS Configuration screen, select **iSNS Discovery Mode** and press **<Enter>**.

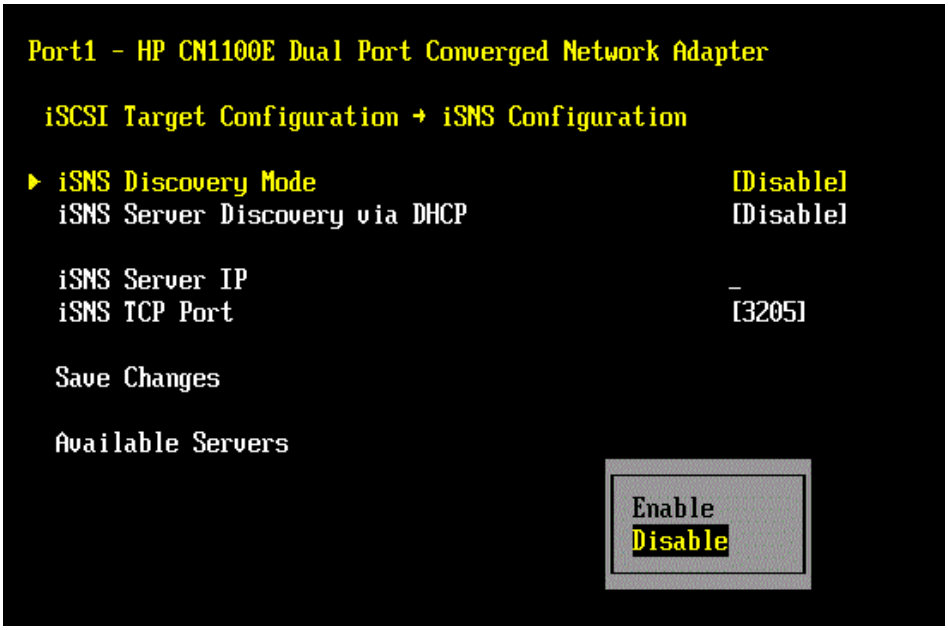

Figure 12-24 iSNS Discovery Mode Screen

2. Select either **Enable** or **Disable** and press **<Enter>**.
3. Select **Save Changes** and press **<Enter>** to save the current settings.

Enabling iSNS Server Discovery via DHCP

This option discovers iSNS servers configured on the network using DHCP.

Note: If you leave iSNS Server Discovery via DHCP disabled (default), you must manually configure the iSNS server.

To enable or disable iSNS server discovery using DHCP:

1. From the iSNS Configuration screen (Figure 12-25), select **iSNS Server Discovery via DHCP** and press **<Enter>**.

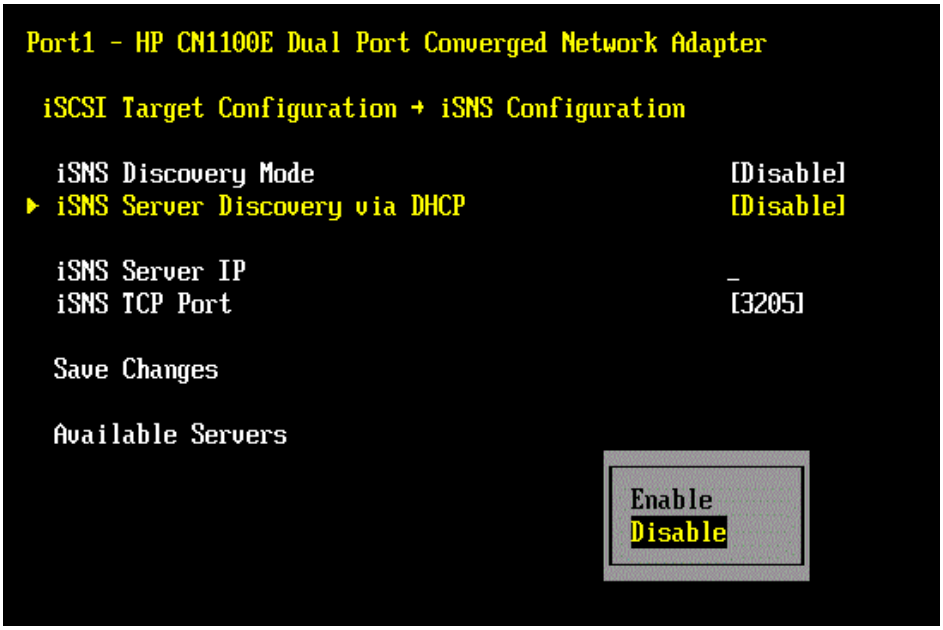

Figure 12-25 iSNS Server Discovery via DHCP Screen

2. Select either **Enable** or **Disable** and press **<Enter>**.
3. Select **Save Changes** and press **<Enter>** to save the current settings.

Configuring the iSNS Server IP Address and TCP Port Number Manually

An iSNS server can also be configured manually by entering the server IP address and the TCP port. Only one iSNS server can be configured at present.

Note: This option is only available when the iSNS Server Discovery via DHCP option is disabled.

To add an iSNS server manually:

1. From the iSNS Configuration screen (Figure 12-26), select **iSNS Server IP** and press **<Enter>**.

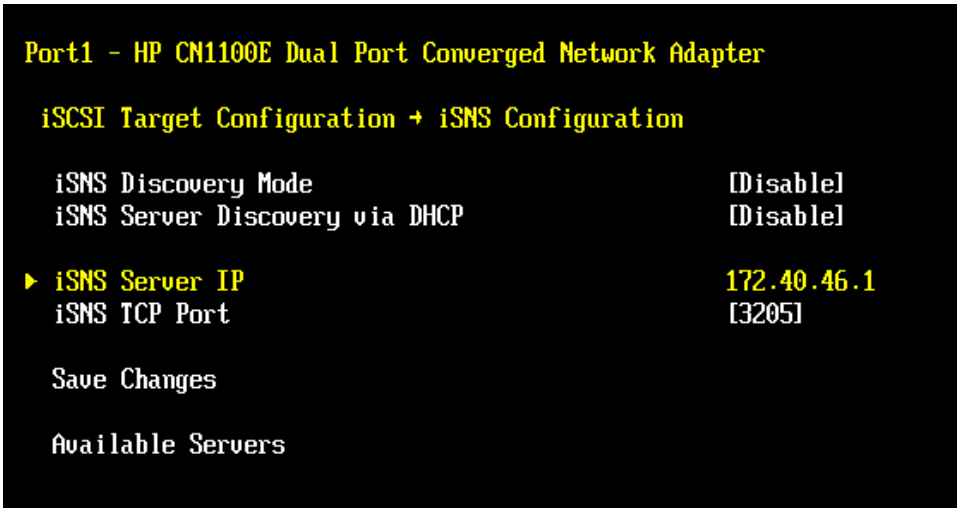
Port1 - HP CN1100E Dual Port Converged Network Adapter
iSCSI Target Configuration → iSNS Configuration
iSNS Discovery Mode [Disable]
iSNS Server Discovery via DHCP [Disable]
iSNS Server IP 172.40.46.1
iSNS TCP Port [3205]
Save Changes
Available Servers

Figure 12-26 iSNS Server IP Screen

2. Enter the iSNS server's IP address and press **<Enter>**.
3. Select **iSNS TCP Port** and press **<Enter>**. The default iSNS Port is 3205. The valid range is 1024–65535.
4. Select **Save Changes** and press **<Enter>** to save the current settings.

   The added server is displayed under the Available Servers list.

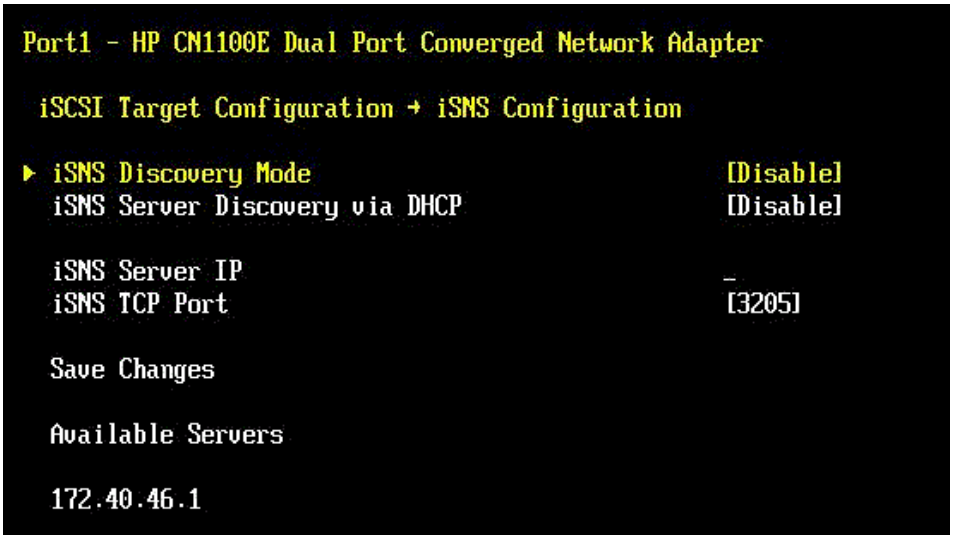
Port1 - HP CN1100E Dual Port Converged Network Adapter
iSCSI Target Configuration → iSNS Configuration
iSNS Discovery Mode [Disable]
iSNS Server Discovery via DHCP [Disable]
iSNS Server IP
iSNS TCP Port [3205]
Save Changes
Available Servers
172.40.46.1

Figure 12-27 Available Servers Screen

Discovering Targets Using the iSNS Server

To configure targets using the iSNS server, from the iSNS Configuration screen (Figure 12-22), select the iSNS server under the Available Servers list and press **<Enter>**.

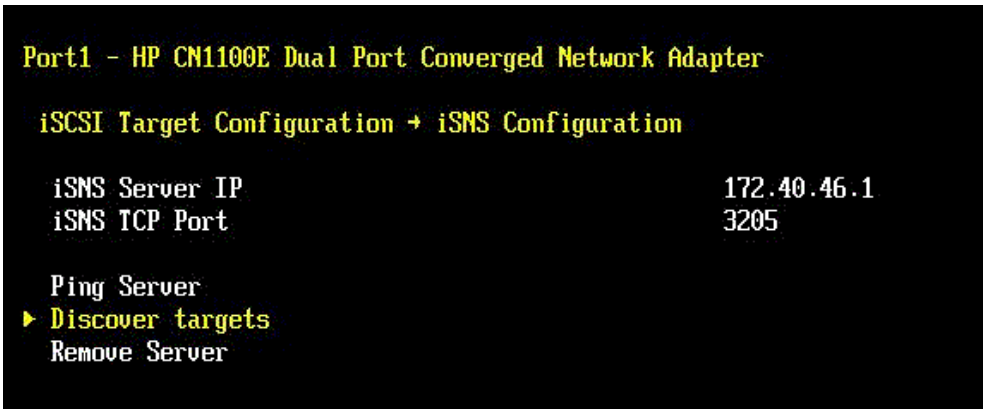
Port1 - HP CN1100E Dual Port Converged Network Adapter
iSCSI Target Configuration → iSNS Configuration
iSNS Server IP 172.40.46.1
iSNS TCP Port 3205
Ping Server
Discover targets
Remove Server

Figure 12-28 iSNS Server Options Screen

The iSNS server IP and TCP port information is displayed.

The following iSNS server options are available on this screen:

- Ping Server – select this option to check connectivity to the server.
- Discover Targets – select this option to display a list of targets available on the iSNS server.

  One or more targets can be added by logging into the targets individually. All added targets are listed under Discovered Targets on the iSCSI Target Configuration screen (Figure 12-22).
- Remove Server – select this option to remove the server from the Available Servers list.

  Note: This only removes the server and not the targets added by this server. To remove the targets, select the target from the Discovered Targets list under the iSCSI Target Configuration screen (Figure 12-22), select **Delete Target**, and press **<Enter>**.

Erasing the Configuration

Erase Configuration erases the configuration of a single controller. Configuration data is erased for both ports on the selected controller. Erase configuration restores the default settings only for that particular controller. When an initiator name is global for all adapters, the IQN configured on the first adapter is reflected on all controllers.

Note: For HP systems, the initiator name on all ports of the selected controller are reset to their respective default values.

Note: You must select **Erase Configuration** to clear out existing IQN data if you purchase a different or subsequent license for the adapter.

To erase a controller configuration:

1. From the Controller Configuration menu, select **Erase Configuration** and press **<Enter>**.

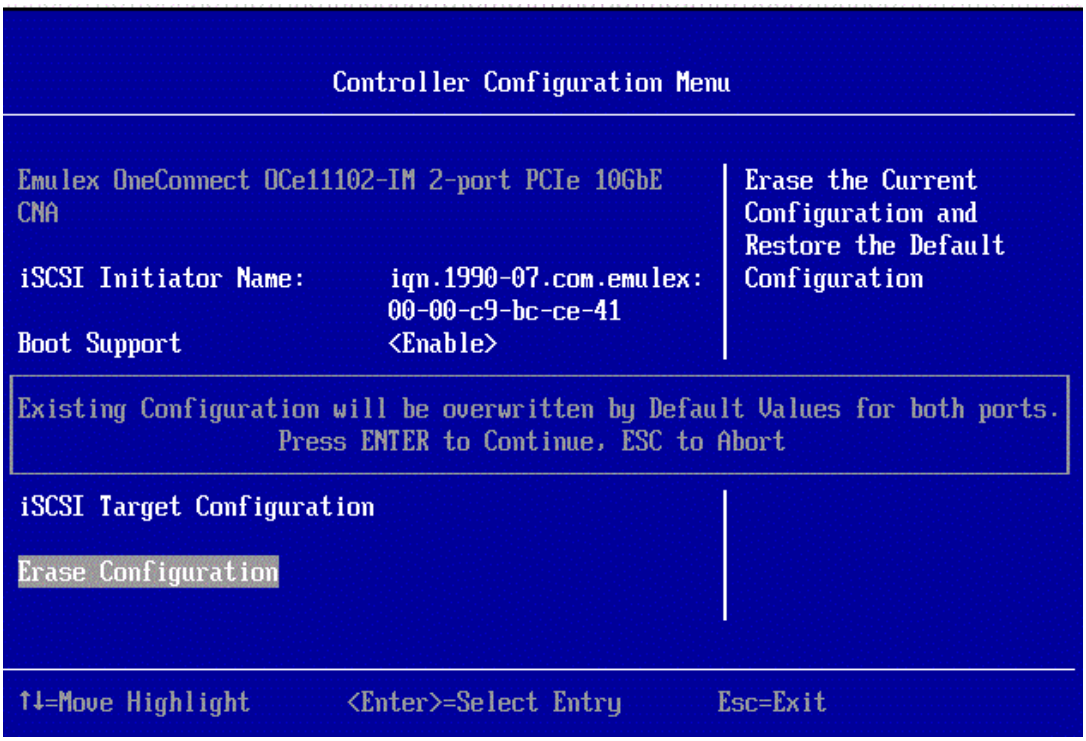
Controller Configuration Menu
Emulex OneConnect OCe11102-IM 2-port PCIe 10GbE CNA
iSCSI Initiator Name: iqn.1990-07.com.emulex:00-00-c9-bc-ce-41
Boot Support <Enable>
Erase the Current Configuration and Restore the Default Configuration
Existing Configuration will be overwritten by Default Values for both ports.
Press ENTER to Continue, ESC to Abort
iSCSI Target Configuration
Erase Configuration
↑↓=Move Highlight
<Enter>=Select Entry
Esc=Exit

Figure 12-29 Erase Configuration Screen

A warning message appears asking for confirmation.

2. Press **<Enter>** to erase the configuration, or press **<Esc>** to abort the operation.

When the controller configuration is erased, the Controller Configuration menu is displayed.

13. Configuring UEFI for FCoE

Note: If you have several adapters in your system, the UEFI system firmware or boot code uses the highest version driver installed on any of the adapters. Adapters with older versions of EFIBoot are managed by the more recent version, but only as long as the adapter with the most recent version is in the system. The latest firmware and boot code must be installed on each adapter in the system to ensure that each adapter runs the latest firmware and boot code.

Overview

UEFIBoot supports:

- Single-topology – only Fabric point to-point is supported.
- EFI protocols – all applicable UEFI 2.3 driver protocols are supported.
- Operating systems – all UEFI-aware operating systems are supported.
- Multi-Device path – fibre/SCSI device path is selectable through the driver configuration application.
- Multi-initiators – up to 256 ports are supported.
- Multi-boot – eight targets are selectable through the driver configuration application.
- Multi-LUNs – up to 4096 LUNs are supported.
- Multi-utility – setup and firmware updates are supported.

The Emulex FCoE UEFIboot is loaded from flash into system memory.

To verify that the Emulex UEFIBoot driver is loaded, enter the EFI Shell, type "`drivers`", and then press **<Enter>**.

Note: If you are using Dell adapters, refer to appendix F., "Dell UEFI," on page 271 for information on using the Dell UEFI utility.

Navigating the Emulex FCoE Configuration Utility

The Emulex FCoE configuration utility has menus and configuration screens. Use the following methods to navigate them:

- Press the up/down arrows on your keyboard to move through and select menu options or configuration fields. When multiple adapters are listed, use the up/down arrows to scroll to the additional adapters.
- Press the **<+>**, **<->**, or **<Enter>** keys to change numeric values.
- Press **<Enter>** to select a menu option, to select a row in a configuration screen, or to change a configuration default.
- Use the navigation entries on the page to move about the utility.
- Press **<Esc>** to exit the current screen and show the previous screen.
- Select **Commit** to save changes. Select **Discard** to not save changes.

- Select **Back to Display Adapters and RECONNECT DEVICES** from the Emulex Adapter Configuration Main Menu when you are finished to ensure the changes are made active; otherwise, a system restart is required to make your changes active.You are then returned to the adapter list.

Starting the Emulex FCoE Configuration Utility

Depending on the OEM UEFI configuration, the Emulex FCoE configuration utility may appear under different setup menus in the OEM system firmware or BIOS (such as **System Settings > Storage**). This description applies to systems where the Emulex utility is found in the Device Manager.

To start the Emulex FCoE configuration utility using HII:

1. Exit the EFI shell.

Figure 13-1 Exiting the EFI Shell

2. A front page is displayed. Launch the Device Manager.
3. On the Device Manager screen, a list of all the adapters in the system is displayed. Your list may vary depending on the installed adapters. Locate the adapter you want to configure. Use the up/down arrows on your keyboard to select it, and press **<Enter>**.

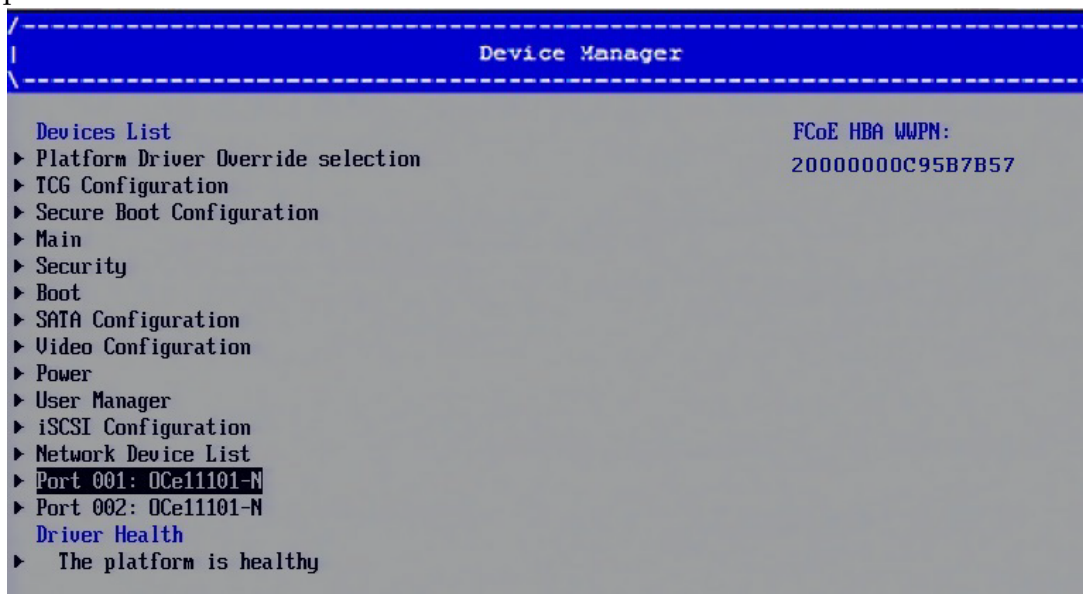

Figure 13-2 Device Manager Screen

The Emulex Adapter Configuration Main Menu is displayed.

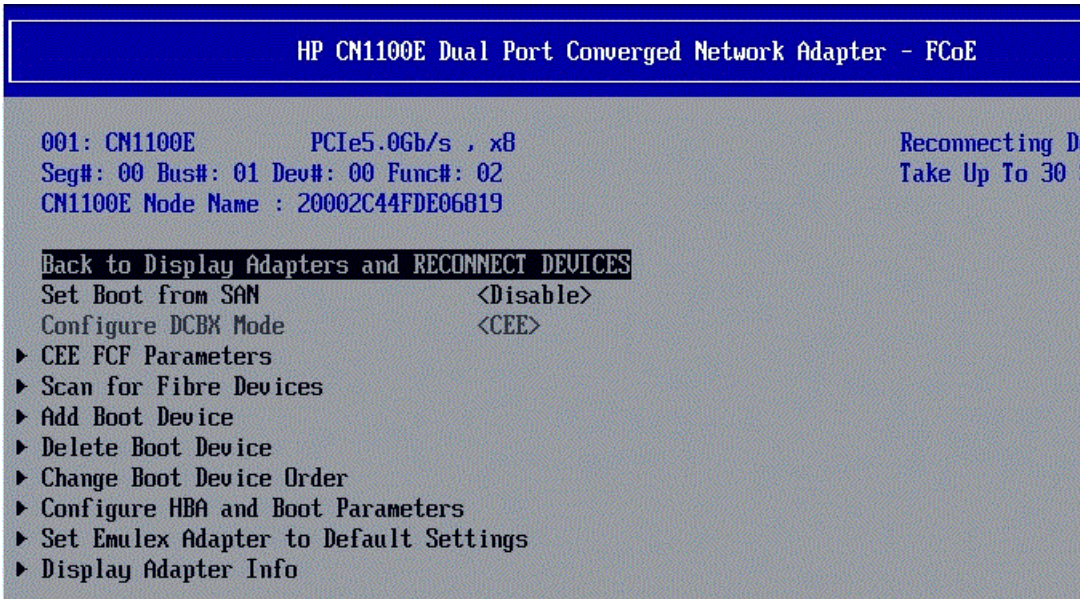
HP CN1100E Dual Port Converged Network Adapter - FCoE
001: CN1100E PCIe5.0Gb/s , x8
Seg#: 00 Bus#: 01 Dev#: 00 Func#: 02
CN1100E Node Name : 20002C44FDE06819
Reconnecting D
Take Up To 30
Back to Display Adapters and RECONNECT DEVICES
Set Boot from SAN <Disable>
Configure DCBX Mode <CEE>
CEE FCF Parameters
Scan for Fibre Devices
Add Boot Device
Delete Boot Device
Change Boot Device Order
Configure HBA and Boot Parameters
Set Emulex Adapter to Default Settings
Display Adapter Info

Figure 13-3 Emulex Adapter Configuration Main Menu

Note: The DCBX mode is always set to CEE and cannot be configured.

Updating Firmware and Boot Code

To update the firmware and boot code to the latest versions, you must use the NIC firmware update utility, which revises the FCoE function with a single firmware and boot code image. For more information on revising firmware versions, see chapter 11., "Configuring UEFI for Ethernet," on page 134.

Enabling an Adapter to Boot from SAN

To enable an adapter to boot from SAN:

1. From the Device Manager screen (Figure 13-2), select the adapter whose network boot setting you want to change and press **<Enter>**.
2. From the Emulex Adapter Configuration Main Menu (Figure 13-3), select **Set Boot from SAN**. The current setting is displayed. A Disable/Enable menu is displayed. Press **<Enter>**.
3. Select **Enable** and press **<Enter>**.The selection is changed to NVRAM and the current setting is displayed.

Configuring CEE FCF Parameters

To configure CEE FCF parameters:

1. From the Device Manager screen (Figure 13-2), select the adapter to configure and press **<Enter>**.
2. From the Emulex Adapter Configuration Main Menu (Figure 13-3), select **Configure CEE FCF Parameters** and press **<Enter>**. A listing of current CEE FCF record information is displayed.

Select the CEE Record you wish to modify (in Flash)
Configure CEE FCF Parameters
Go to Configuration Main Menu
01. UNSD VLANID: 000 Sw Name: 00000000 00000000,
Fab Name: 00000000 00000000
02. UNSD VLANID: 000 Sw Name: 00000000 00000000,
Fab Name: 00000000 00000000
03. UNSD VLANID: 000 Sw Name: 00000000 00000000,
Fab Name: 00000000 00000000
04. UNSD VLANID: 000 Sw Name: 00000000 00000000,
Fab Name: 00000000 00000000
05. UNSD VLANID: 000 Sw Name: 00000000 00000000,
Fab Name: 00000000 00000000
06. UNSD VLANID: 000 Sw Name: 00000000 00000000,
Fab Name: 00000000 00000000
B/b=Previous Page
R/r=Reset to Defaults
S/s=Save
^v=Move Highlight
<Enter>=Select Entry
X/x=Exit this Menu

Figure 13-4 CEE Record Selection List

3. Select the CEE FCF record to modify and press **<Enter>**. The current record information is displayed.

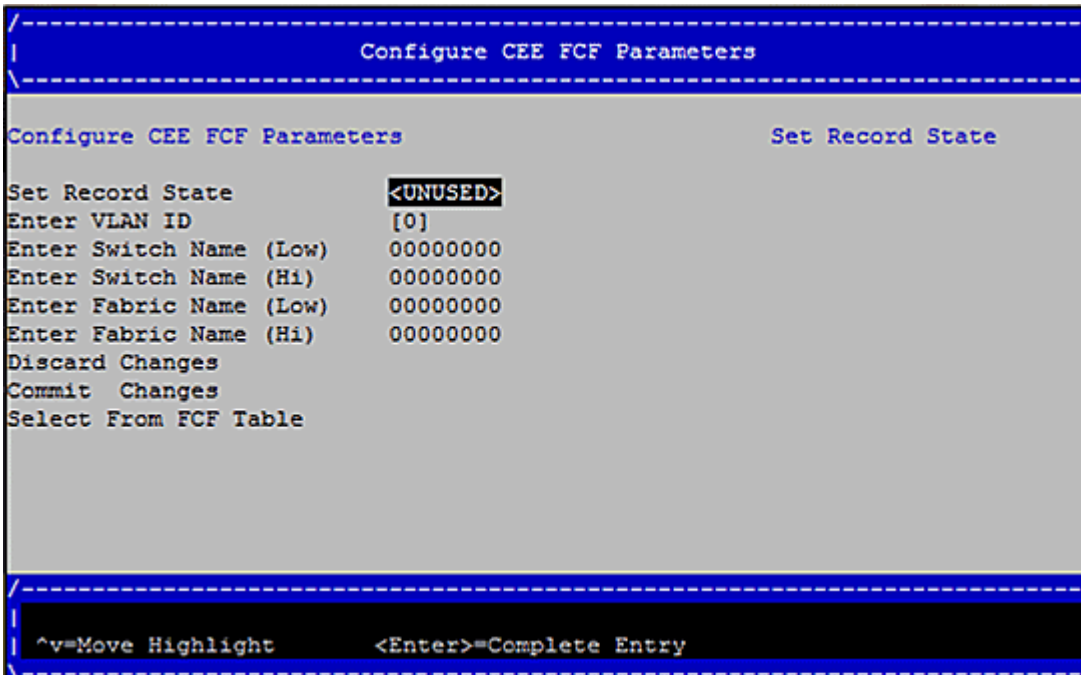

Figure 13-5 CEE FCF Record Information

4. Change the record information as needed.
   - Set Record State can be set to unused, active, or boot.
   - VLAN ID must be a three digit hexadecimal number.
   - Switch Name (Low). Enter the low bits of the FC switch's WWN to which to connect. This must be an 8-digit hexadecimal number.
   - Switch Name (Hi). Enter the high bits of the FC switch's WWN to which to connect. This must be an 8-digit hexadecimal number.
   - Fabric Name (Low). Enter the low bits of the FC fabric's WWN to which to connect. This must be an 8-digit hexadecimal number.
   - Fabric Name (Hi). Enter the high bits of the FC fabric's WWN to which to connect. This must be an 8-digit hexadecimal number.
5. Do one of the following:
   - To save your changes, select **Commit Changes** and press **<Enter>**. The changed CEE FCF record information is displayed.
   - To discard all changes, select **Discard Changes** and press **<Enter>**. The CEE record selection list is displayed (Figure 13-4).
   - To discard your changes and use the CEE parameters from the FCF table, select **Select From FCF Table** and press **<Enter>**. The FCF table parameters are displayed.
6. Press **<Enter>**. The Emulex Adapter Configuration Main Menu is displayed.

Scanning for Fibre Devices

When LUNs are set up on the SAN before POST has completed (that is, before the boot driver has been started), you can select 'Scan for Fibre Devices' or 'Add Boot Device' to discover all available LUNs. Although this procedure does not perform a complete HBA initialization, it executes faster than selecting “Reconnect Devices”.

Note: If you dynamically add LUNs after POST has completed and the driver has been started, you must select **Reconnect Devices** to perform a complete HBA initialization and discovery. If this step is not performed, all LUNs may not be properly discovered.

You should also select **Reconnect Devices** after adding any discovered LUNs to the NVRAM list.

To scan for Fibre devices:

1. From the Device Manager screen (Figure 13-2), select the adapter that you want to scan for Fibre devices and press **<Enter>**.
2. From the Emulex Adapter Configuration Main Menu, select **Scan for Fibre Devices** and press **<Enter>**. A list of discovered targets is displayed. This is only a list of discovered target devices to quickly determine SAN connectivity and provide you with a mechanism to have the port logged in for zoning.

Adding Boot Devices

To add a boot device:

1. From the Device Manager screen (Figure 13-2), select the adapter to which you want to add a boot device and press **<Enter>**.

2. From the Emulex Adapter Configuration Main Menu (Figure 13-3), select **Add Boot Device** and press **<Enter>**. Discovered targets are displayed.

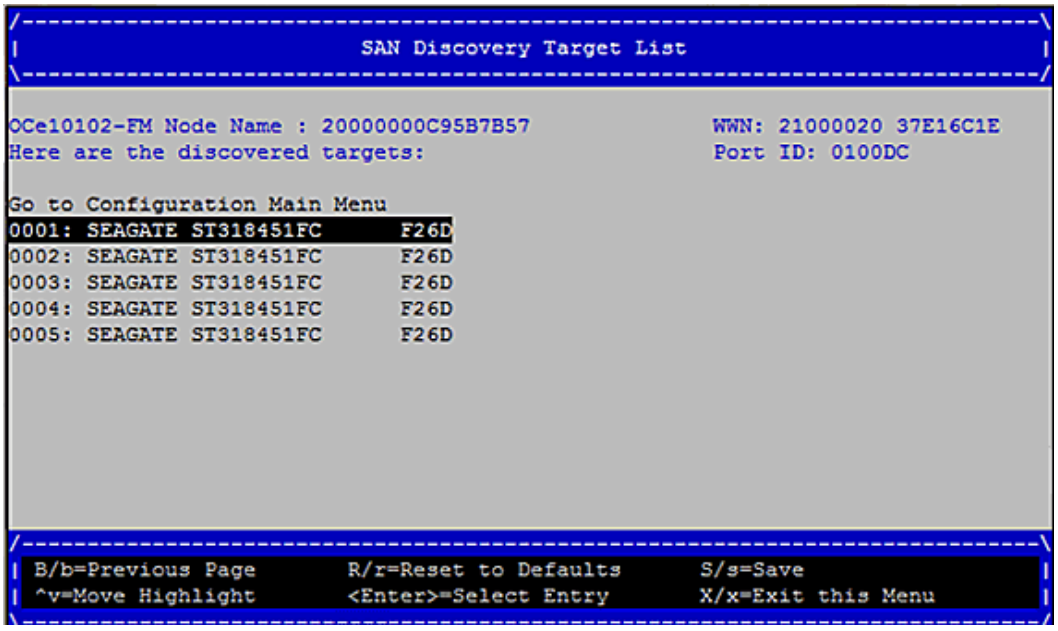

Figure 13-6 SAN Discovery Targets List

3. Select a target and press **<Enter>**.
4. Select a LUN from the list and press **<Enter>**. The target list is displayed.

Figure 13-7 LUN Listing

5. Select **Commit Changes** and press **<Enter>**. The Emulex Adapter Configuration Main Menu is displayed.

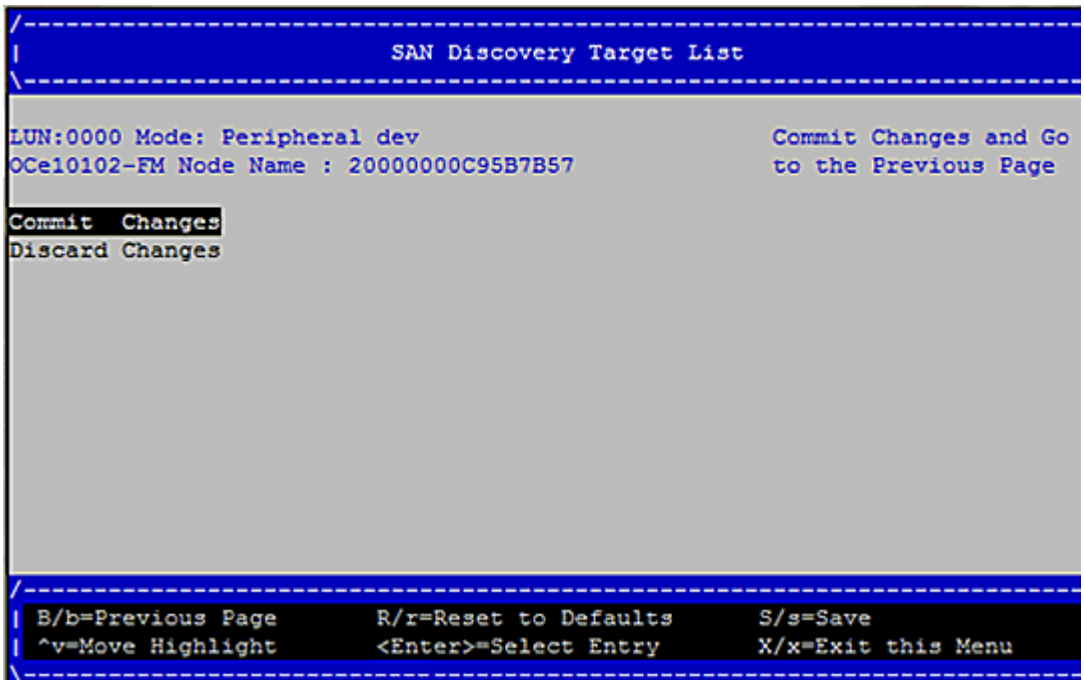

Figure 13-8 Commit/Discard Change

Deleting Boot Devices

To delete boot devices:

1. From the Device Manager screen (Figure 13-2), select the adapter from which you want to delete a boot device and press **<Enter>**.
2. From the Emulex Adapter Configuration Main Menu (Figure 13-3), select **Delete Boot Device** and press **<Enter>**. A list of eight boot devices is displayed.

3. Select the device and press **<Enter>**. The Delete Boot Device menu for that device is displayed.

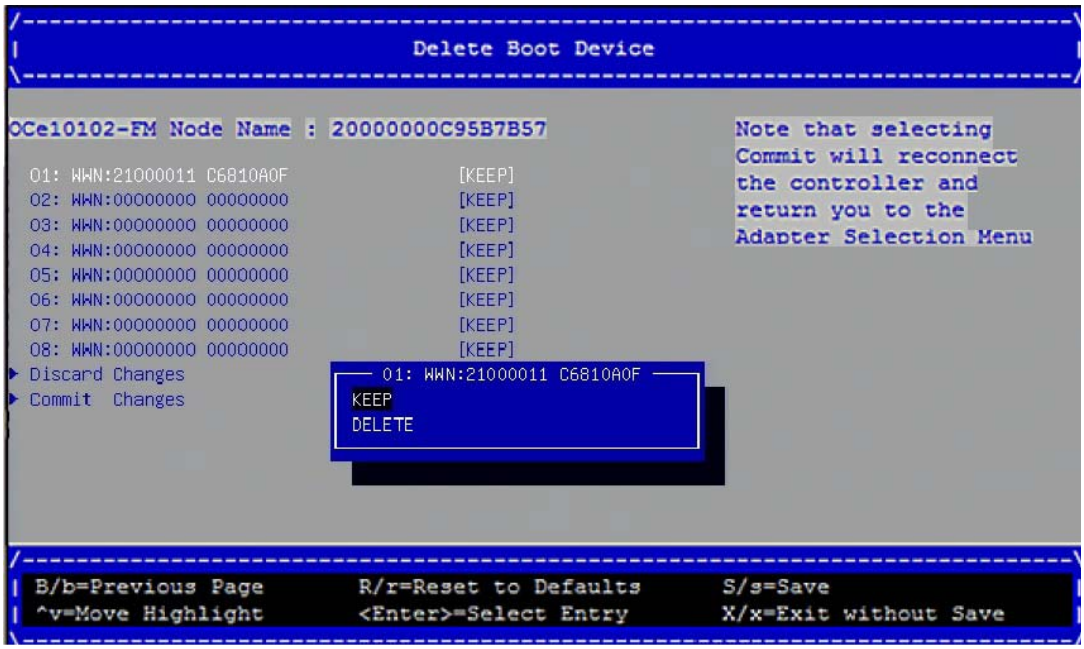

Figure 13-9 Delete Boot Device Screen

4. Select either **KEEP** or **DELETE** and press **<Enter>.**
5. Select **Commit Changes** and press **<Enter>**. The Emulex Adapter Configuration Main Menu is displayed.

Changing Boot Device Order

Note: The boot device order has no relationship to the system BIOS boot device order. Changing the boot device order with this procedure will only change the order that the devices are discovered by UEFIBoot.

To change boot device order:

1. From the Device Manager screen (Figure 13-2), select the adapter whose boot device order you want to change and press **<Enter>**.
2. From the Emulex Adapter Configuration Main Menu (Figure 13-3), select **Change Boot Device Order** and press **<Enter>**. The Change Boot Device Order screen is displayed.

3. Select **Boot Device Order** and press **<Enter>**.

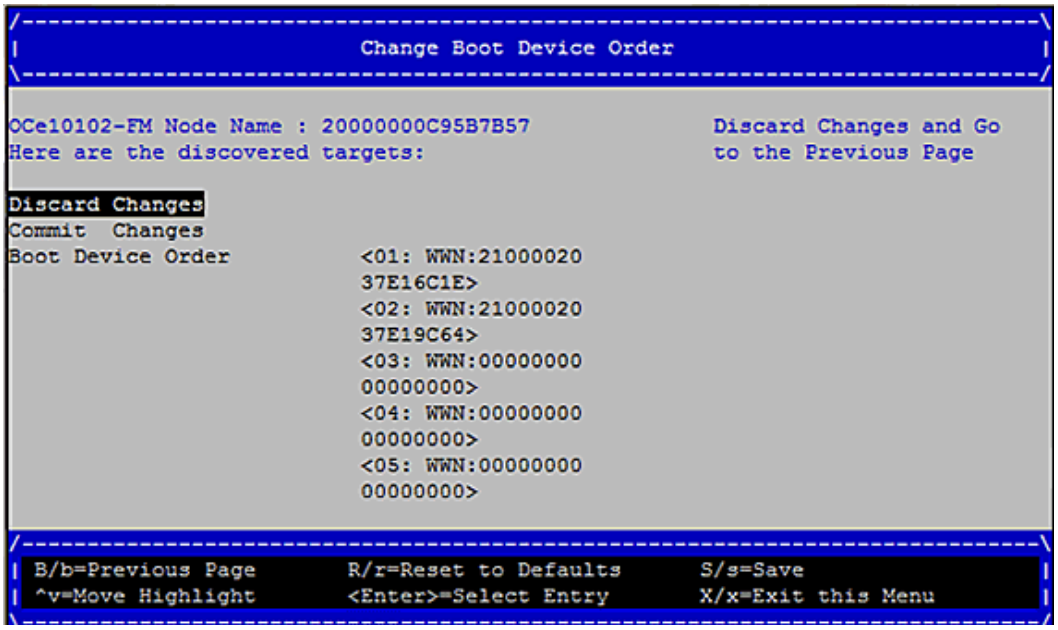

Figure 13-10 Change Boot Device Order Screen

4. Select a device from the list of eight boot devices and press **<Enter>**.

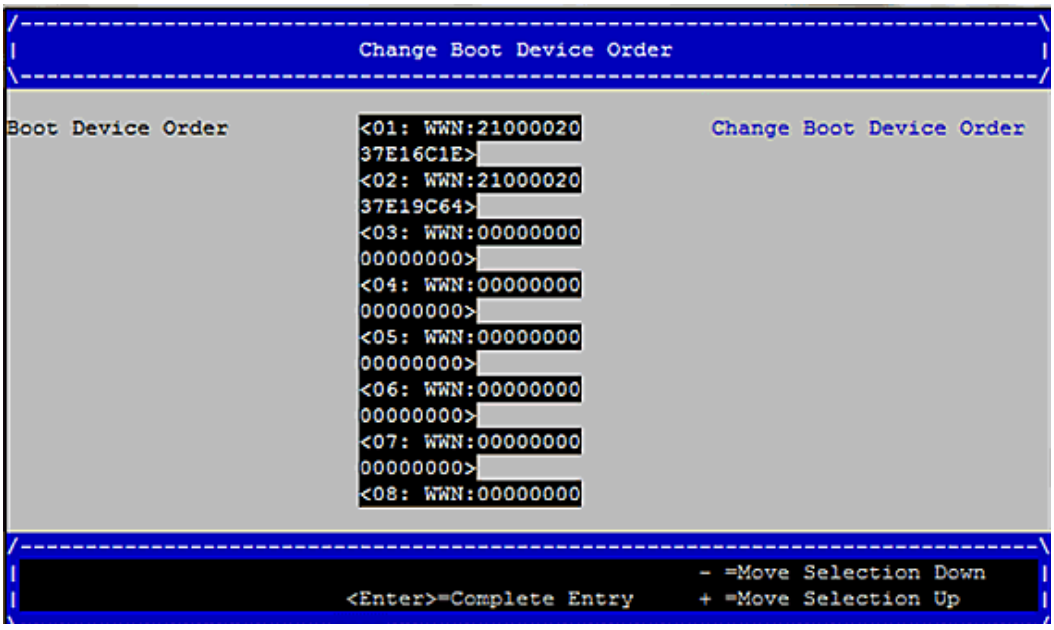

Figure 13-11 Boot Device Order Screen

5. Use the <+> or <-> keys to change the order of the selected device on the dialog box and press **<Enter>**. A screen shows the new boot device order.

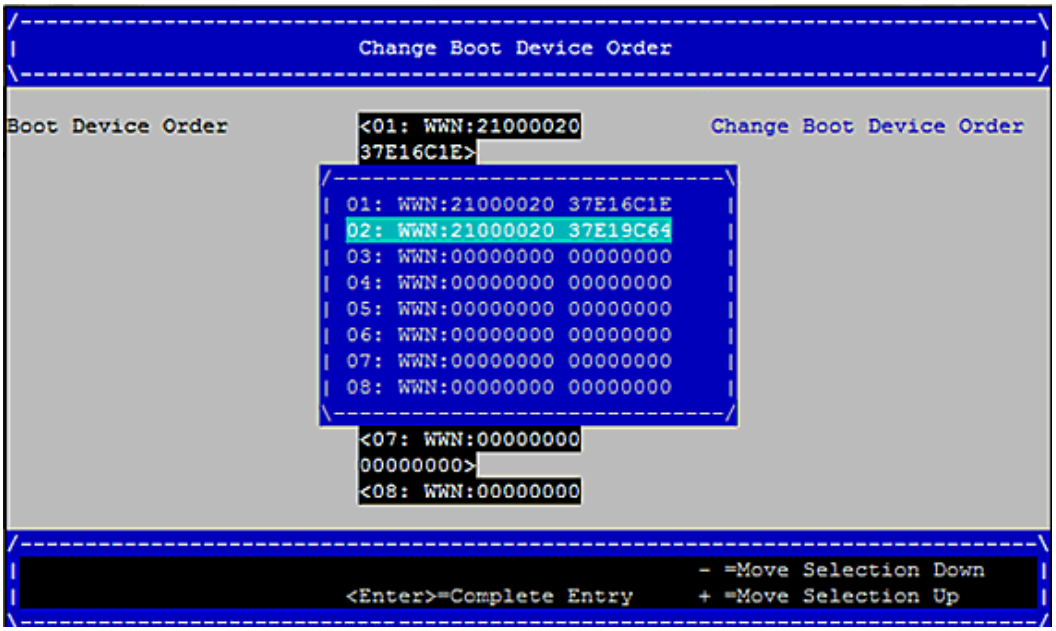

Figure 13-12 Change Boot Device Order Screen

6. Verify that the boot device list order is correct. Press **<Enter>**.

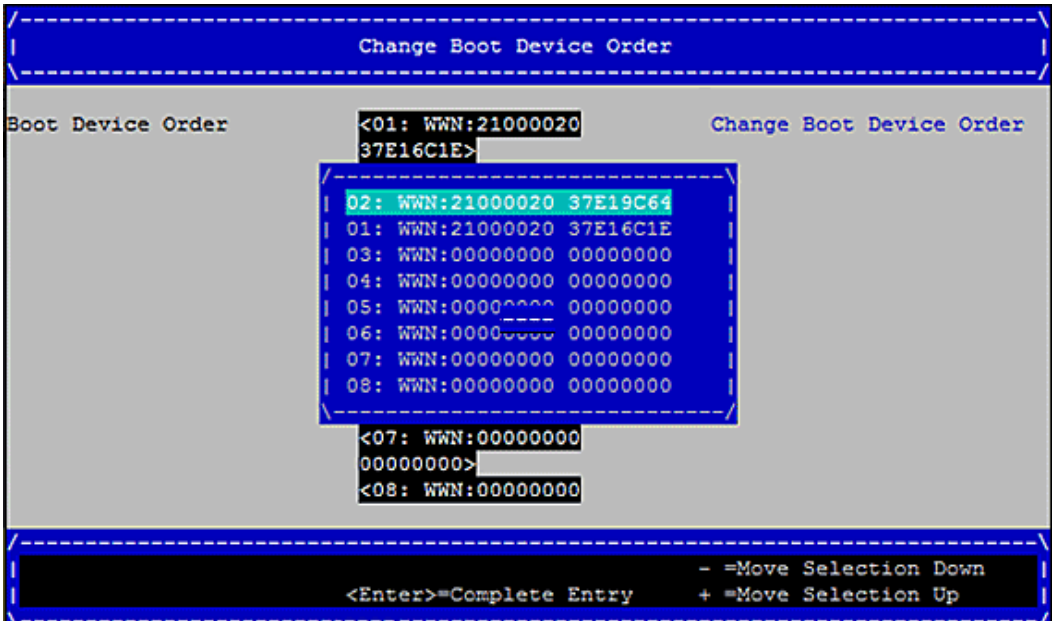

Figure 13-13 Change Boot Device Order Screen with Revised Boot Order

7. Select **Commit Changes** and press **<Enter>**. The revised order is saved to the NVRAM. The Emulex Adapter Configuration Main Menu is displayed.

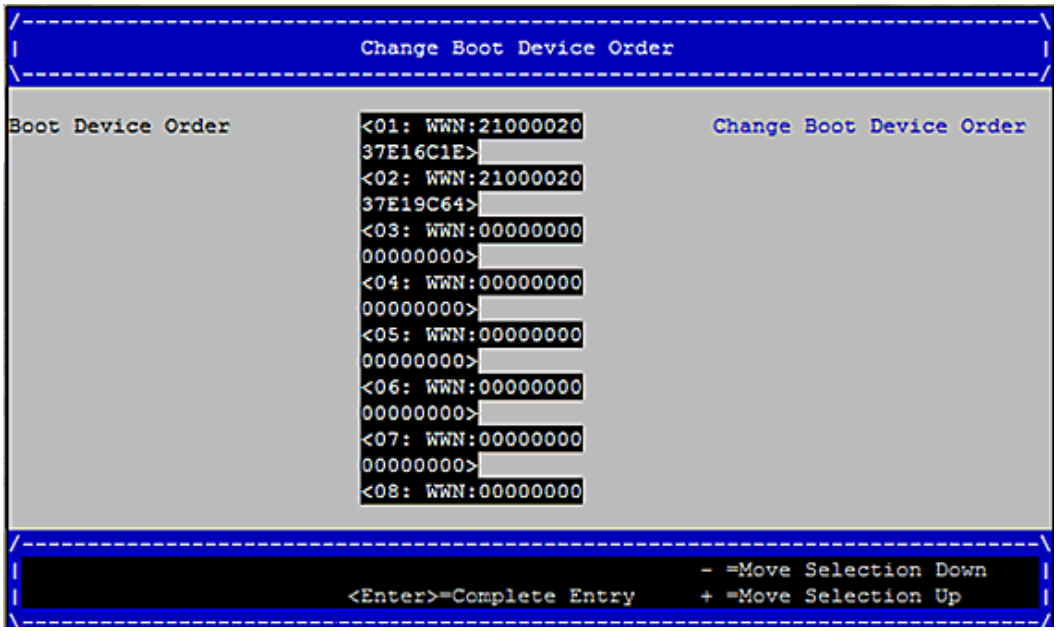

Figure 13-14 Change Boot Device Order

8. From the Emulex Adapter Configuration Main Menu, select **Back to Display Adapters and RECONNECT DEVICES** to complete configuration or select another configuration option.

Configuring Adapter Parameters

Changing the PLOGI Retry Timer

This option allows you to set the interval for the PLOGI retry timer. This option is especially useful for Tachyon-based RAID arrays. Under very rare occasions, a Tachyon-based RAID array resets itself and the port goes offline temporarily in the loop. When the port comes to life, the PLOGI retry interval scans the loop to discover this device.

You can choose:

- Disable – Default
- 50 Msec
- 100 Msec
- 200 Msec

To change timer values:

1. From the Device Manager screen (Figure 13-2), select the adapter to configure and press **<Enter>**.

2. From the Emulex Adapter Configuration Main Menu (Figure 13-3), select **Configure HBA Parameters** and press **<Enter>**. The Configure HBA Parameters screen is displayed.
3. From the Configure HBA Parameters screen, select **PLOGI Retry Timer** and press **<Enter>**. The PLOGI Retry Timer menu is displayed.

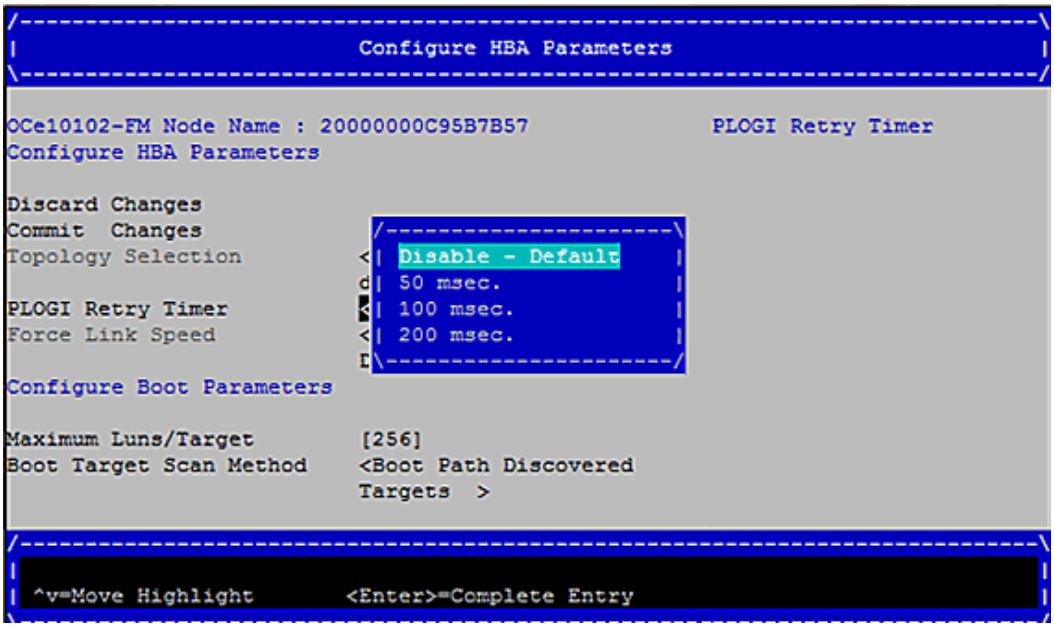

Figure 13-15 PLOGI Retry Timer

4. Select a retry timer option and press **<Enter>**. The screen is refreshed with the modified value.

   Note: Press **<Esc>** to return to the EFI utility menu.

5. Select **Commit Changes** and press **<Enter>**. The Emulex Adapter Configuration Main Menu is displayed.

Changing the Maximum LUNs per Target

The maximum number of LUNs represents the maximum number of LUNs that are polled during device discovery. The minimum value is 1, the maximum value is 4096. The default is 256.

To change the maximum number of LUNs:

1. From the Device Manager screen (Figure 13-2), select the adapter whose LUNs per target information you want to change and press **<Enter>**.
2. From the Emulex Adapter Configuration Main Menu (Figure 13-3), select **Configure HBA Parameters** and press **<Enter>**. The Configure HBA Parameters screen is displayed.

3. From the Configure HBA Parameters screen, select **Maximum LUNs/Target** and press **<Enter>**.

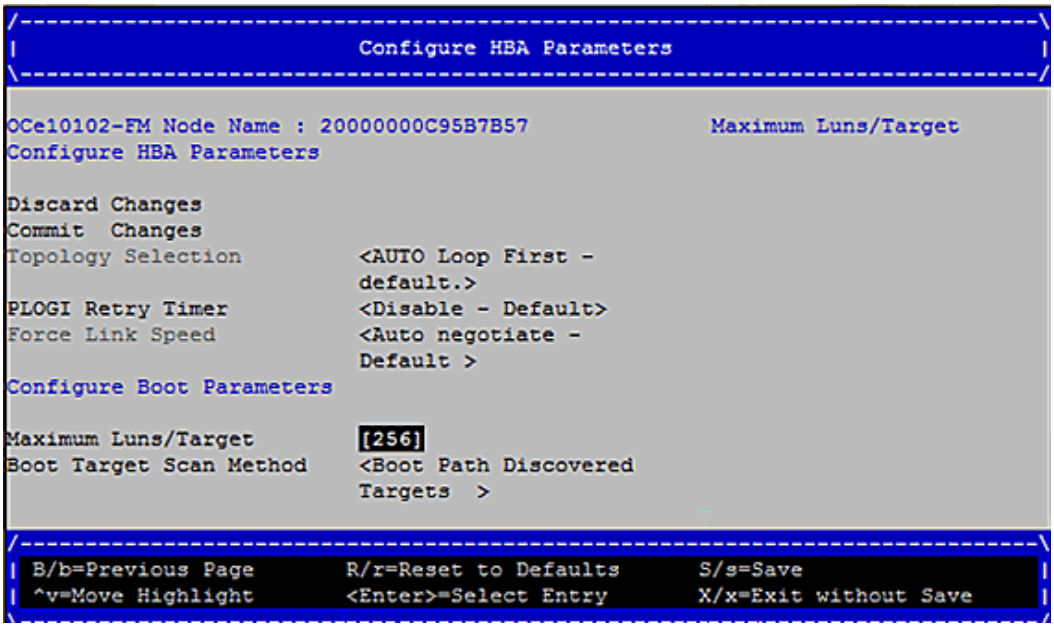

Figure 13-16 Configure HBA Parameters – Maximum LUNs/Target Field

4. Type a decimal value between 1 and 4096 and press **<Enter>**. The screen is refreshed with the modified value.

   Note: The default and typical maximum number of LUNs in a target device is 256. A higher number of maximum LUNs causes the discovery to take more time.

5. Select **Commit Changes** and press **<Enter>**. The Emulex Adapter Configuration Main Menu is displayed.

Changing Boot Target Scan Method

This option is only available if none of the eight boot entries is configured to boot from the DID or WWPN. The Emulex Adapter Configuration Main Menu is used to configure up to eight boot entries. With boot scan enabled, the first device issues a Name Server Inquiry.

The boot scan options are:

- Boot Path from NVRAM Targets – Boot scan discovers only LUNs that are saved to the adapter's NVRAM. Select up to eight attached devices to use as potential boot devices. Limiting discovery to a set of eight selected targets can greatly reduce the time it takes for the EFIBoot driver to complete discovery.
- Boot Path from Discovered Targets – Boot scan discovers all devices that are attached to the FC port. Discovery can take a long time on large SANs if this option is used.
- Do not create boot path.

- EFIFCScanLevel: NVRAM Targets – Boot scan sets the EFIFCScanLevel environment variable to inform the driver to configure only targets in the NVRAM boot table.
- EFIFCScanLevel - Discovered Targets – Boot scan sets the EFIScanLevel environment variable to inform the driver to configure all available targets on the SAN.

To change the boot target scan method:

1. From the Device Manager screen (Figure 13-2), select the adapter whose boot target scan method you want to change and press **<Enter>**.
2. From the Emulex Adapter Configuration Main Menu (Figure 13-3), select **Configure HBA Parameters** and press **<Enter>**. The Configure HBA Parameters is displayed.
3. From the Configure HBA Parameters menu, select **Boot Target Scan Method** and press **<Enter>**. The Boot Target Scan Method menu is displayed.

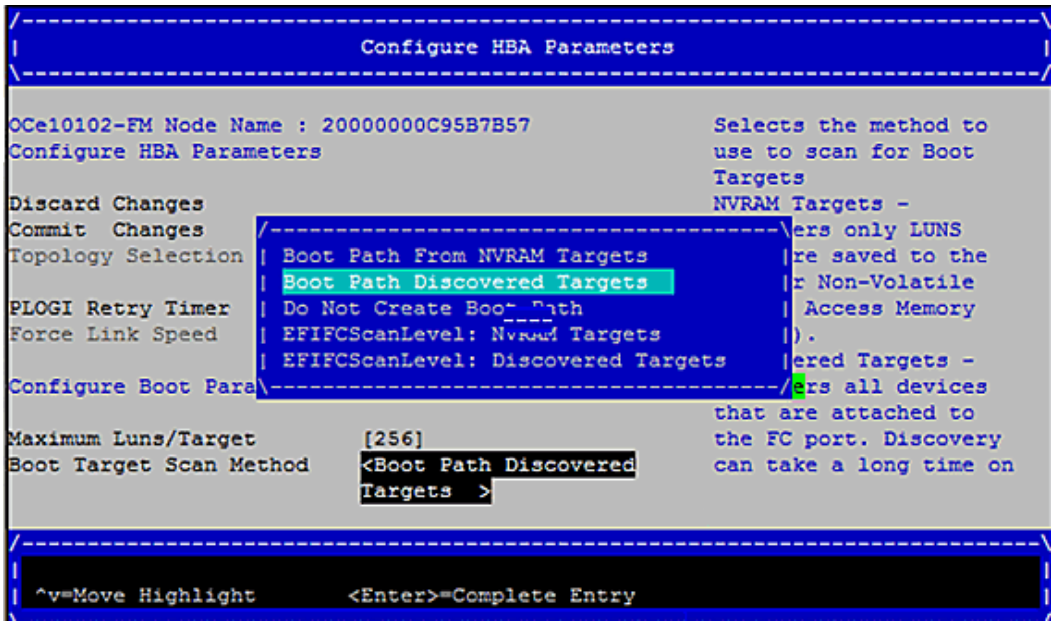

Figure 13-17 Configure HBA Parameters – Boot Target Scan Method Menu

4. Select a boot scan option and press **<Enter>**. The screen is refreshed with the modified value.

   Note: If you have a large SAN and set the boot path to "Boot Path Discovered Targets," discovery takes a long time. Press **<Esc>** to return to the EFI utility menu.

5. Select **Commit Changes** and press **<Enter>**. The Emulex Adapter Configuration Main Menu is displayed.

Changing Device Discovery Delay

This parameter sets a delay to occur after an loop initialization and before a scan is initiated to discover the target. The default is off or 0 seconds. Change the default if you have an HP MSA1000 or HP MSA1500 RAID array and if both of the following conditions exist:

- The MSA array is direct connected or part of an arbitrated loop (for example, daisy chained with a JBOD).
- The boot LUN is not reliably discovered. In this case, a delay may be necessary to allow the array to complete a reset.

Caution: Do not change the delay device discovery time if your MSA array is connected to a fabric switch. Setting it to any other time guarantees that the maximum delay time is seen on every loop initialization.

If both of the above conditions exist, typically set this parameter to 20 seconds. However, the delay should be only long enough for the array to be reliably discovered after a reset. Your value may be different.

To change the delay device discovery value:

1. From the Device Manager screen (Figure 13-2), select the adapter whose device discovery delay settings you want to change and press **<Enter>**.
2. From the Emulex Adapter Configuration Main Menu (Figure 13-3), select **Configure HBA Parameters** and press **<Enter>**. The Configure HBA Parameters is displayed.
3. From the Configure HBA Parameters menu, select **Delay Device Discovery** and press **<Enter>**.

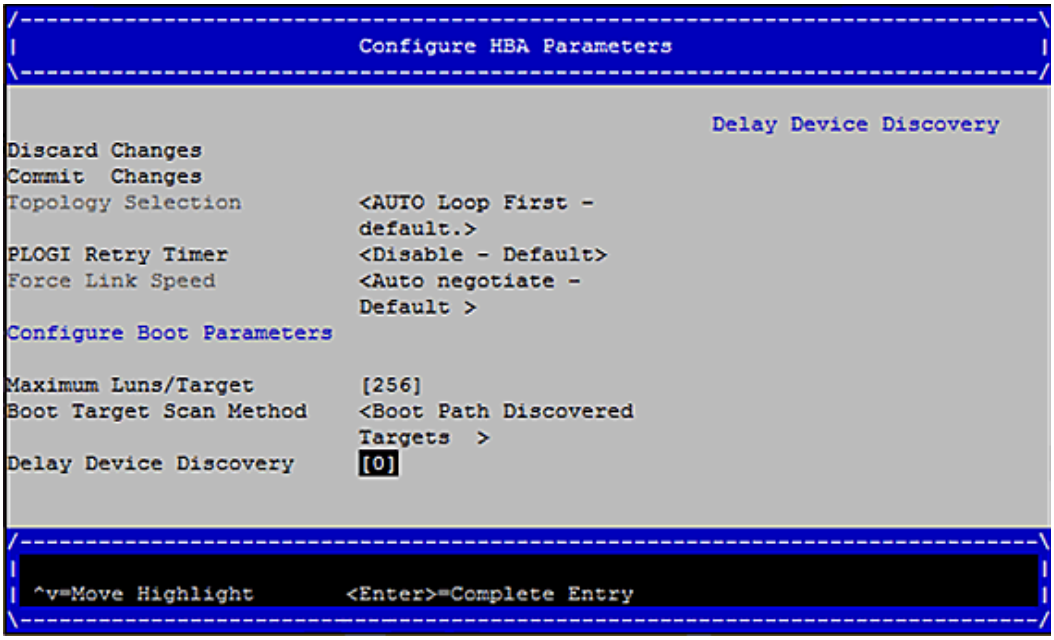

Figure 13-18 Configure HBA Parameters – Delay Device Discovery

4. Use the +/- keys to change the delay device discovery value in increments of 10 seconds and press **<Enter>**. The screen is refreshed with the modified value.
5. Select **Commit Changes** and press **<Enter>**. The Emulex Adapter Configuration Main Menu is displayed.

Resetting Emulex Adapters to Default Values

The EFI utility enables you to clear the NVRAM target list and set all boot device WWNNs back to 0, along with setting the adapter back to the default values. These default values are listed in Table 13-1.

Table 13-1 Adapter Default Values

Parameter	Default Value	Valid Values
Enable/Disable BIOS	Disabled	Enabled Disabled
PLOGI Retry Timer	Disabled	Disabled 50 msec 100 msec 200 msec
Boot Target Scan	Boot path from NVRAM targets	Boot path from NVRAM targets Boot path discovered targets Do not create boot path
Maximum LUNs Setting	0256	0–4096
Delay Device Discovery	0000	0000–0255
Advanced Mode	Enabled (OCe11100-series and the LPe16202/OCe15100 CFA) Disabled (OCe10100-series controllers)	Enabled Disabled
PXE Boot Support	The default for this parameter varies depending on the vendor configuration.	Enabled Disabled
SR-IOV	Disabled	Enabled Disabled
VLAN Support	Disabled	Enabled Disabled
VLAN ID	0	0–4094
VLAN Priority	0	0–7
Multichannel Support	The default for this parameter varies depending on the vendor configuration.	Enabled Disabled
Function En/Dis	Disabled	Enabled Disabled

Table 13-1 Adapter Default Values (Continued)

Parameter	Default Value	Valid Values
Bandwidth	0%	Must have a total of 100% across all ports.
LPVID	0	2–4094
Switch Option (IBM Virtual Fabric-capable configuration, if available)	IBM Virtual Fabric Mode	IBM Virtual Fabric Mode IBM Unified Fabric Protocol Mode Switch Independent Mode

Note: The following example sets the default values for FC and FCoE adapters only. To set other adapters to their default settings, you must use the utility for that specific protocol.

To set Emulex adapters to their default settings:

1. From the Device Manager screen (Figure 13-2), select the adapter whose default settings you want to change and press **<Enter>**.
2. From the Emulex Adapter Configuration Main Menu (Figure 13-3), select **Set Emulex Adapter to Default Settings** and press **<Enter>**.

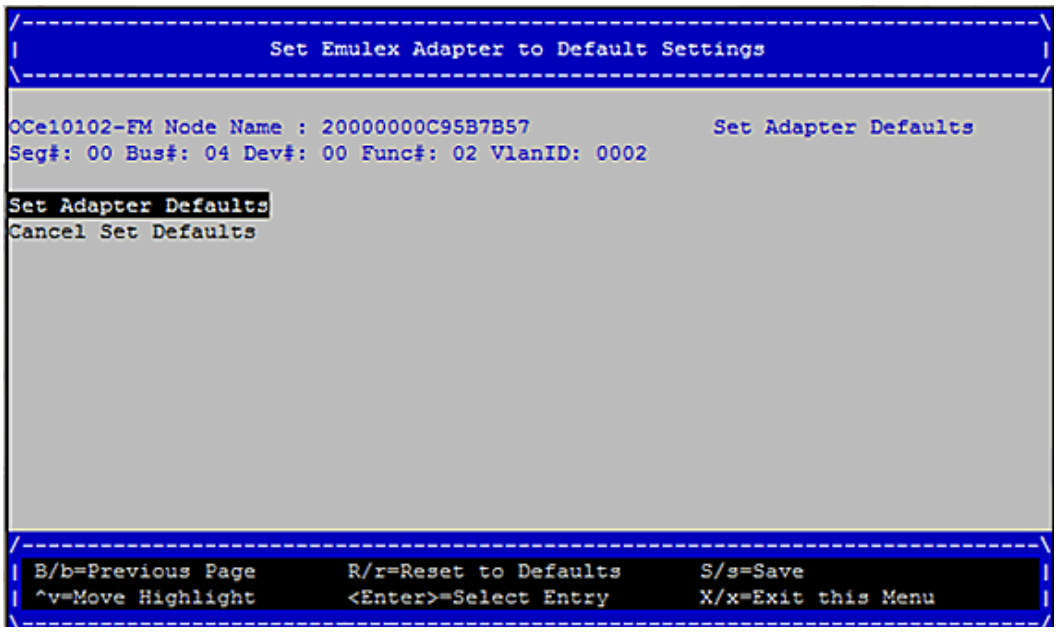

Figure 13-19 Set Adapter Defaults

Note: This will set the adapter to the FCoE driver default settings only.

3. Select **Set Adapter Defaults** and press **<Enter>** to set the adapter back to its default values. The Emulex Adapter Configuration Main Menu is displayed.
4. From the Emulex Adapter Configuration Main Menu, select **Back to Display Adapters and RECONNECT DEVICES** to complete configuration or select another configuration option.

Displaying Adapter Information

The Adapter Information screen shows the following information about the selected adapter:

- Adapter status
- Network boot status
- Link speed
- Topology
- Firmware version – refer to this firmware version if reporting a problem to Emulex Technical Support
- Universal boot version
- EFI Boot version

To display adapter information:

1. From the Device Manager screen (Figure 13-2), select the adapter whose information you want to view and press **<Enter>**.
2. From the Emulex Adapter Configuration Main Menu (Figure 13-3), select **Display Adapter Info** and press **<Enter>**. Information about the selected adapter is displayed.

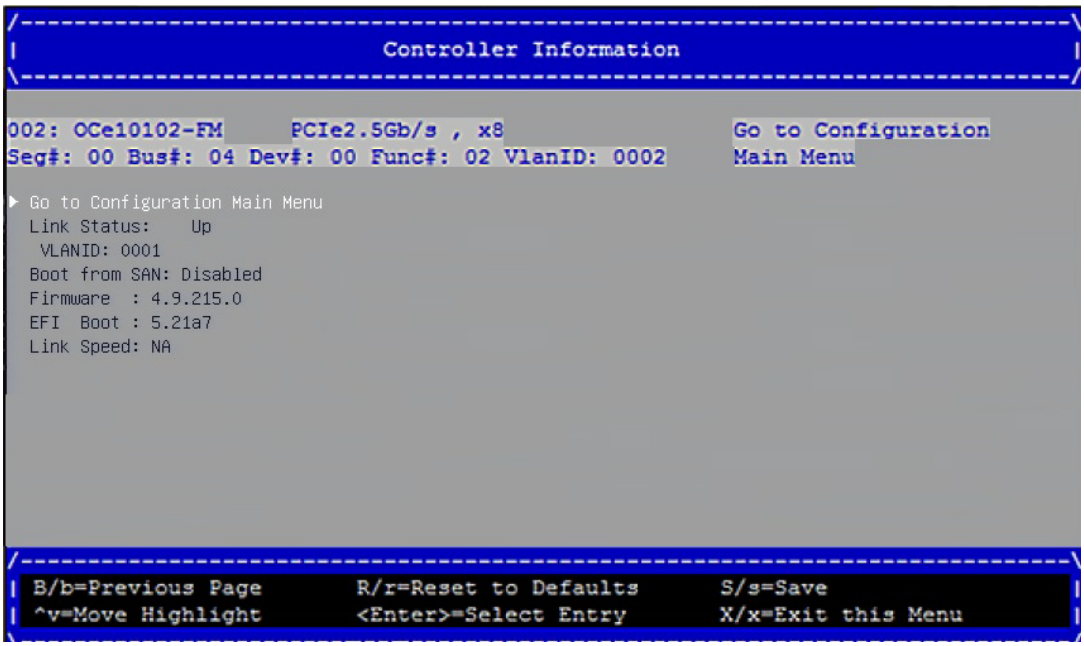

Figure 13-20 Controller Information

14. Troubleshooting

Troubleshooting for the NIC Protocol

Issues During the PXE Boot Process

Situation: If any of the following occur during the boot process:

- The PXE boot ROM sends a DHCP request extended with PXE specific options, but the request is not received.
- The DHCP responses do not contain the DHCP options (DHCPOFFERs) that include the NBP filename and boot server lists.
- The PXE client attempts to download the specified NBP over TFTP from one of the specified boot servers, but fails.
- The PXE client does not execute the downloaded NBP.

Outcome: If any of these issues occur, the boot process continues using the next available device in the boot sequence.

PXE Error Codes

Table 14-1 PXE Error Codes

Error Codes	Possible Reason	Comment/Solution
Init Error Codes		
PXE-E01: PCI Vendor and Device IDs do not match!	The PCI BIOS passes Bus/Device/Function numbers in AX register when it initializes the OptionROM. If the vendor ID & device ID did not match the vendor ID and the device ID in the device's PCI configuration space, with the UNDI device PCI structure defined in UNDI driver initialization code, this error is displayed.	This message should never be seen in the production level BIOS.
PXE-E04: Error reading PCI Configuration space	Any of the PCI BIOS INT 1Ah calls to read the PCI configuration space failed.	This should not happen with any production level motherboard BIOS.
PXE-E07: PXE BIOS calls not supported.	The PCI system BIOS does not support INT 1Ah services.	This should not happen with any PCI BIOS as all PCI BIOS must support these services.

Table 14-1 PXE Error Codes (Continued)

Error Codes	Possible Reason	Comment/Solution
ARP/TFTP Error Codes		
PXE-E11:ARP timeout	An ARP request is tried four times and the client did not receive an ARP reply.	Check the DHCP server settings. If you are connected through a switch, also check the switch settings.
PXE-E32: TFTP Open timeout.	A DHCP address and boot file name has been obtained and attempts to download the file name from a remote server.	• Check that the TFTP is configured properly. • Check that the filename is properly placed in the tftpboot directory. • Check that the PXE server is configured for TFTP not MTFTP.
PXE-E35: TFTP read timeout.	A TFTP server is not able to receive the next packet.	Check that the hardware and TFTP server are functioning properly.
PXE-E36: Error received from TFTP server.	A TFTP server sends an error packet.	Check the TFTP server settings and boot file settings.
PXE-E38: TFTP cannot open connection.	A TFTP client is not able to open a TFTP connection with the TFTP server.	Check that the correct boot file is copied into the default TFTP boot path.
PXE-E3B: TFTP error-File not found	A requested boot file is not found on TFTP server.	Check that the correct boot file is copied into the default TFTP boot path.
PXE-E3C: TFTP error - Access violation.	The TFTP server does not have enough access rights to open or read the file.	Check the TFTP server's file permissions.
PXE-E3F: TFTP packet size is invalid	TFTP packet received is larger than 1456 bytes.	Check the MTU on the Server side NIC interface.
Boot/DHCP Error Codes		
PXE-E51: No DHCP or Proxy DHCP offers were received.	The client did not receive any valid DHCP, BOOTP, or Proxy DHCP offers.	Check that the bootfile name is configured correctly for PXE Clients in the DHCP setup.
PXE-E52: Proxy DHCP offers were received. No DHCP offers were received.	The client did receive at least one valid proxyDHCP offer, but did not receive any valid DHCP or BOOTP offers.	Check that the DHCP server and PXE server are configured properly.
PXE-E53: No boot filename received.	The client did receive a valid BOOTP/DHCP offer, but does not have a boot file name to download in the DHCP offer.	Check that the bootfile name is configured correctly for PXEClients in the DHCP setup.

Table 14-1 PXE Error Codes (Continued)

Error Codes	Possible Reason	Comment/Solution
PXE-E55: Proxy DHCP service did not reply to request on port 4011.	The client issued a proxyDHCP request to the DHCP server on port 4011 but did not receive a reply.	Check that the DHCP server and TFTP server are properly configured on different servers. This issue may happen only when both are configured on separate servers.
UNDI Error Codes		
PXE-E60: Invalid UNDI API function number	The underlying UNDI drivers do not support the UNDI API sent from BaseCode/NBP.	Check with the hardware vendor.
PXE-E61: Media test failed, check cable.	There is no physical link on the PXE client port on which the boot is attempted.	Check the cables on the NIC interface.
PXE-E63: Error while initializing the NIC.	There is an issue in initializing the hardware as part of the UNDI_Initialize API.	Check with the hardware vendor.
BaseCode/UNDI Loader Error Codes		
PXE-EC1: BaseCode ROM ID structure was not found.	The UNDI boot module can not find the BaseCode ROM ID structure. This may be caused by a corrupted BaseCode ROM image.	
PXE-EC3: BaseCode ROM ID structure is invalid.	The BaseCode ROM ID structure is invalid. This may be caused by a corrupted BaseCode image in ROM.	
PXE-EC4: UNDI ROM ID structure was not found.	The BaseCode loader module could not locate the UNDI ROM ID structure. The UNDI ROM image is probably corrupted.	
PXE-EC5: UNDI ROM ID structure is invalid.	The UNDI ROM image is probably corrupted.	
PXE-EC8:!PXE structure was not found in UNDI driver code segment.	The UNDI ROM image is probably corrupted.	
Bootstrap and Discovery Error Codes		
PXE-E74: Bad or missing PXE menu and /or prompt information	PXE tags were detected but the boot menu and/or boot prompt were not found or were invalid.	

Table 14-1 PXE Error Codes (Continued)

Error Codes	Possible Reason	Comment/Solution
PXE-E77: Bad or missing discovery server list.	There are two possible reasons. One is that Multicast and Broadcast discovery are both disabled. The other is that Multicast and Broadcast are enabled, but the server list tag is not found or is invalid.	
PXE-E78: Could not locate boot server.		
PXE-E79: NBP is too big to fit in free base memory.	The NBP file size is larger than the free base memory.	Check the NBP file size.
Miscellaneous Error Codes		
PXE-EA0: Network boot cancelled by keystroke	Pressing **<Ctrl>** and **<C>** during DHCP discovery.	

Troubleshooting for the iSCSI Protocol

The following section includes troubleshooting information for the iSCSISelect utility. Ensure that you also lookup the readme.txt file located on CD1 for the most current troubleshooting issues.

Table 14-2 Troubleshooting the iSCSISelect Utility

Issue	Answer/Solution
iSCSI BIOS banner is not displayed during system post.	• Check the motherboard BIOS configuration and make sure that the Option ROM is enabled and is set for the PCIe slot into which the adapter is inserted. • If the Option ROM is enabled and is set for the PCIe slot into which the adapter is inserted and the issue persists, erase the Controller Configuration. For more information, see “Erasing the Current Configuration” on page 118.

Table 14-2 Troubleshooting the iSCSISelect Utility (Continued)

Issue	Answer/Solution
Unable to ping iSCSI target IP address	• Check cable connections and make sure they are securely connected at both ends. Make sure the link light is ON at both ends of the cable. • Verify that you have assigned a valid IP address with the correct subnet mask to the interfaces that are connected to the network. • Check for duplicate IP addresses. • Make sure you are connected to the correct port. • If the IP address is coming from DHCP, check that the DHCP server is up and available. • Is the target on a different subnet? Check the default gateway and make sure that the IP addresses of both the default gateway and the remote host are correct. • Check link status under Network Configuration. If you try changing the initiator link status, you can back out one screen then go back to Network Configuration to see a view of your current link status.
Login to iSCSI target fails or login succeeds, but no LUNs are available.	• Check initiator IQN name and target IQN name. Verify that they are properly specified. • Check target's ACL settings (if any) to verify that the initiator's IQN name is listed and can be recognized. • Make sure that the target login parameters are compatible with the initiator's. • If this checklist confirms that initiator and target are configured correctly and the issue persists, erase the Controller Configuration. For more information, see “Erasing the Current Configuration” on page 118.
Login to iSCSI target is successful, but iSCSI I/O causes the system to hang or freeze.	Check the jumbo frame settings on the iSCSI target. If enabled, change the frame size to 1514 and retry. This isolates any issues in the network related to jumbo frames. Jumbo frames, when supported by the entire network, provide increased performance. **Note:** OneConnect adapters support jumbo frames.

Table 14-2 Troubleshooting the iSCSISelect Utility (Continued)

Issue	Answer/Solution
Unable to boot from the iSCSI target.	• Check the target setup. Check the target ACL to verify that the initiator's iSCSI name is listed and can be recognized. • Check the initiator name and make sure it is correct. • If applicable, verify that you have selected the iSCSI LUN as the boot LUN in your system BIOS setting. • Check the system BIOS for boot device priority order. Make sure that the boot device is at the top. If using DHCP: • If Boot Support is not enabled, enable it on the iSCSI Initiator menu. (For more information, see chapter 9., "Configuring and Managing the iSCSI Initiator with the iSCSISelect Utility," on page 108.) If DHCP boot support is enabled, check the DHCP setup and also verify that you have added the root path to the DHCP server. For more information, see "Setting Up a Basic iSCSI Boot Configuration" on page 105. • If this checklist confirms that the initiator and target are configured correctly and the issue persists, erase the Controller Configuration. For more information, see "Erasing the Current Configuration" on page 118.
BIOS post shows "BIOS Not Installed" message.	• If you *have not* configured an iSCSI boot target, this is proper normal behavior. • If you *have* configured an iSCSI boot target and the BIOS cannot find a bootable LUN, then refer to the solutions provided in the issue *Unable to boot from the iSCSI target*.
If solutions for issues 1-3 and 5-6 all fail.	Use the iSCSISelect utility to erase the controller configuration. To clear controller configuration: 1) From the Controller Configuration menu, select **Erase Configuration** and press **<Enter>**. 2) A message appears asking if you want to erase the current configuration. Press **<Y>**. 3) You are cautioned that the operation removes any existing configuration permanently. Press **<Y>**. **Note:** If you have multiple controllers, you must erase the configuration of each controller separately. For more information, see "Erasing the Current Configuration" on page 118. After you erase the controller configuration, reboot the system and then reconfigure the adapter.

You receive this POST error message:
`Initiator iSCSI Name mismatch, Please use iSCSISelect to set a single name for all controllers.`
`Press <Ctrl><S> to enter iSCSISelect. (Reboot required)`
	In the iSCSI BIOS, the iSCSI initiator name may be different if there is more than one Emulex adapter in the system. If the iSCSI initiator name is different on multiple controllers, you receive a POST error message indicating an iSCSI name mismatch. You must enter the iSCSISelect utility and save a new initiator name on the first iSCSISelect utility menu screen so that the iSCSI initiator name on all controllers match. All logins from the multiple controllers use the new name.

Table 14-2 Troubleshooting the iSCSISelect Utility (Continued)

Issue	Answer/Solution

You receive any of the following POST error messages or warnings:
`Redboot Initialization failed...`
`Firmware Load failed...`
`DDR config failed...`
`DDR callibrate failed...`
`DDR test failed...`
`SEEPROM checksum failed...`
`Secondary firmware image loaded...`
	These POST messages indicate that you must reload the adapter firmware using OneCommand Manager or one of the Emulex online or offline utilities. If the errors persist, contact Technical Support.

You receive this POST error message: `Firmware halted. This firmware does not support this controller.`	The firmware loaded on this adapter is not supported. Load the appropriate firmware for the controller.

Troubleshooting for the FCoE Protocol

Table 14-3 Troubleshooting the FCoE Protocol

Issue	Answer/Solution
Cisco Nexus switch configuration situations: • Windows creates the NTFS partition properly, but then reports that “The hard disk containing the partition or free space you chose has a LUN greater than 0. Setup cannot continue”. (Dell 1850 server). • Windows reboots successfully, but then gets stuck during the GUI portion of the installation right from the beginning. (HP DL385G2 server).	Ensure that the FCoE switch ports are configured correctly for the adapter’s FCoE settings.

Appendix A. Configuring iSCSI through a DHCP Server using Vendor-Specific Option 43

Overview

An iSCSI initiator requires the following parameters to boot from a target:

- Its IP address
- Its unique node name
- The boot iSCSI target's IP address
- The boot target's name. If not available, this may be discovered using the iSCSI discovery protocol.
- The target's non-default TCP port number (if applicable)
- Header and data digest settings to be used with the target
- Authentication parameters, if applicable

If your boot BIOS allows it, you can configure all of the above parameters from a centrally configured DHCP server using vendor-specific option 43. This appendix documents this method of configuration. For this method, the initiator must be configured (using non-DHCP means) with the appropriate DHCP vendor ID. The method and format for specifying the vendor ID is outside the scope of this document. The initiator offers this Vendor ID to the DHCP server to retrieve data in the format described in the following sections.

Two other methods for configuration are not documented in this appendix:

- Manual configuration using iSCSISelect or SMCLP/MILI
- Pre-boot configuration using CLP /BIOS 3.0

Format of Vendor-Specific Option 43

The format for vendor-specific option 43 is as follows:

```
iscsi:<ipaddress>:<protocol>:<iscsi port number>:<lun>:<target name>
```

Fields enclosed in angular brackets (including the angular brackets) should be replaced with their corresponding values. All fields are case insensitive.

See the example at the end of this document.

Description of Parameters

<ipaddress>

Replace this parameter with a valid IPv4 address in dotted decimal notation. This is a mandatory field.

<protocol>

Replace this parameter with a decimal number indicating the TCP port. The default TCP port is 3260.

<iscsi port number>

Replace this parameter with a decimal number ranging from 1 to 65535 (inclusive). It is an optional field.

<lun>

This parameter is a hexadecimal representation of logical unit number of the boot device. It is an optional field. If not provided, LUN 0 is assumed to be the boot LUN. It is an 8-byte number which must be specified as a hexadecimal number consisting of 16 digits, with an appropriate number of 0's padded to the left, if required.

<target name>

Replace this parameter with a valid iSCSI target 'iqn' name of up to 223 characters. This is a mandatory field.

Example

```
iscsi:010.010.010.001:0:3260:0:iqn.1992-08.com.netap:sn.151729740
```

The above example specifies the following:

- Target IP address: 010.010.010.001
- Target protocol: 0
- Target TCP port: 3260
- Target boot LUN: 0
- Target iqn name: iqn.1992-08.com.netap:sn.151729740

Appendix B. Example for Installing and Configuring Linux or Citrix for PXE Boot and UEFI Boot

Linux and Citrix PXE Server Remote Installation Procedure

PXE configuration requires a PXE server and the PXE client.

Setting up a PXE server requires the following configurations:

- NFS server
- TFTP server
- DHCP server
- PXE boot server

The pxelinux functionality occurs in this order:

1. The client machine boots to PXE which requests a DHCP address.
2. The DHCP server responds with an IP address for the client machine along with the address of a TFTP server and a filename to load (pxelinux.0) from that server.
3. The client downloads pxelinux.0 from the specified TFTP server and executes it.
4. The pxelinux.0 file searches the pxelinux.cfg directory on the server for a configuration file that matches the IP address of the machine. If no matches are found, it attempts to load a file called default.
5. The configuration file loaded by pxelinux.0 has instructions on what to do next. Some of the choices include boot to local hard drive, boot to an image file (floppy image), or load vmlinuz and initrd.img.
6. The client searches for a configuration file with the IP address converted to hexadecimal (for example, 192.168.1.60 becomes C0A8013C) or the MAC address of your PXE boot client's Ethernet card with a prefix of "01". The MAC address should be separated with dashes instead of colons.

   In this example, the client looks for the following configuration file names and uses the first one it finds.

   ```
   01-00-00-C9-5B-75-A8
   C0A8013C
   C0A8013
   C0A801
   C0A80
   C0A8
   C0A
   C0
   C
   default
   ```

7. The default file's contents should look similar to the following:

```
prompt 1
default linux
timeout 100

label linux
kernel vmlinuz
append initrd=initrd.img ramdisk_size=9216 noapic acpi=off
```

PXE Server

NFS Server Configuration Script

```
[root@bglinux156 ~]# mkdir /work
[root@bglinux156 ~]# mount 10.192.194.110:/work /mnt
[root@bglinux156 ~]# cd /mnt/
[root@bglinux156 ~]# cp -r rhel5564/ /work/ #copy the entire
 directory to "/work"
[root@bglinux156 ~]# cd /work/rhel5564
[root@bglinux156 ~]# cp -r images/ /tftpboot/linux-install/
[root@bglinux156 ~]# vim /etc/exports###(Add "/work *(rw,sync)")
[root@bglinux156 ~]# exportfs -a (reflect changes in NFS Server)
```

1. Restart NFS Services.

```
[root@bglinux156 ~]# /etc/rc.d/init.d/portmap restart
Stopping portmap: [ OK ]
Starting portmap: [ OK ]
[root@bglinux156 ~]# /etc/rc.d/init.d/nfslock restart
Stopping NFS locking: [ OK ]
Stopping NFS statd: [ OK ]
Starting NFS statd: [ OK ]
[root@bglinux156 ~]# /etc/rc.d/init.d/nfs restart
Shutting down NFS mountd: [ OK ]
Shutting down NFS daemon: [ OK ]
Shutting down NFS quotas: [ OK ]
Shutting down NFS services: [ OK ]
Starting NFS services: [ OK ]
Starting NFS quotas: [ OK ]
Starting NFS daemon: [ OK ]
Starting NFS mountd: [ OK ]
```

2. Check if the NFS services are running.

```
[root@bglinux156 ~]# rpcinfo -p
 program vers proto port
```

```
100000 2 tcp 111 portmapper
100000 2 udp 111 portmapper
100021 1 udp 56782 nlockmgr
100021 3 udp 56782 nlockmgr
100021 4 udp 56782 nlockmgr
100021 1 tcp 44855 nlockmgr
100021 3 tcp 44855 nlockmgr
100021 4 tcp 44855 nlockmgr
100024 1 udp 766 status
100024 1 tcp 769 status
100011 1 udp 815 rquotad
100011 2 udp 815 rquotad
100011 1 tcp 818 rquotad
100011 2 tcp 818 rquotad
100003 2 udp 2049 nfs
100003 3 udp 2049 nfs
100003 4 udp 2049 nfs
100003 2 tcp 2049 nfs
100003 3 tcp 2049 nfs
100003 4 tcp 2049 nfs
100005 1 udp 828 mountd
100005 1 tcp 831 mountd
100005 2 udp 828 mountd
100005 2 tcp 831 mountd
100005 3 udp 828 mountd
```

TFTP Server Setup

```
[root@bglinux156 ~]# vi /etc/xinetd.d/tftp

service tftp
{
 socket_type = dgram
 protocol = udp
 wait = yes
 user = root
 server = /usr/sbin/in.tftpd
 server_args = -s /tftpboot/linux-install #This line specifies
 #path where the pxe boot searches for
 #the images
 disable = no #convert this line from yes to no
 per_source = 11
 cps = 100 2
```

```
 flags = IPv4
}

[root@bglinux156 ~]# /sbin/chkconfig --level 345 xinetd on
[root@bglinux156 ~]# /sbin/chkconfig --level 345 tftp on
[root@bglinux156 ~]# service xinetd restart
```

DHCP Server Configuration

1. Install the following RPMs in the server if not installed:

```
[root@bglinux156 ~]# rpm -qa | grep dhcp
dhcpv6-client-1.0.10-18.el5
dhcp-devel-3.0.5-23.el5
dhcp-3.0.5-23.el5
```

2. Make the following entry in /etc/dhcpd.conf file:

```
#
# DHCP Server Configuration file.
# see /usr/share/doc/dhcp*/dhcpd.conf.sample
#
ddns-update-style interim;
 subnet 192.168.1.0 netmask 255.255.255.0 {
 range 192.168.1.50 192.168.1.90;
 default-lease-time 3600;
 max-lease-time 4800;
 option subnet-mask 255.255.255.0;
 option domain-name "pxe_text";
 option time-offset -8;
 }

host bglinux45{
 next-server 192.168.1.1;
 hardware ethernet 00:00:C9:5B:75:A8;
 fixed-address 192.168.1.60;
 option host-name "linux-test";

  filename "pxelinux.0";
 }
###This sets up a DNS server that will assign IP Address 192.168.1.60
###to the client machine that has MAC Address "00:00:C9:5B:75:A8"
###assigned to a PXE capable NIC
###The only thing that needs to be changed in the above, is the MAC
###Address to match that of the NIC in the client box
###The IP address that follows the next-server option should be the IP
###address of the tftp server

[root@bglinux156 ~]# service dhcpd restart
Shutting down dhcpd: [ OK ]
```

```
Starting dhcpd: [ OK ]
```

PXE Boot Server Configuration

```
[root@bglinux156 ~]# rpm -qa | grep system-config-netboot
system-config-netboot-cmd-0.1.45.1-1.el5
system-config-netboot-0.1.45.1-1.el5
```

Copying Files to the TFTP Server with the Graphical Version of the Network Booting Tool

Copy the files necessary to start the installation to the TFTP server to enable them to be found when the client requests them. Run the Network Booting Tool on the NFS, FTP, or HTTP server. A separate PXE server is not necessary.

To use the graphical version of the Network Booting Tool, you must be running the X Window System, have root privileges, and have the redhat-config-netboot RPM package installed.

To start the Network Booting Tool from the desktop, do one of the following:

- Go to the Main Menu Button (on the Panel) and select **System Settings >Server Settings >Network Booting Service.**

  -or-

- Type the command system-config-netboot at a shell prompt. (For example, in an XTerm or a GNOME terminal.)

  Note: If you are starting the Network Booting Tool for the first time, select **Network Install from the First Time Druid**.

Copy the files necessary to start the installation to the TFTP server.

1. Select **Configure > Network Installation** from the pull-down menu.

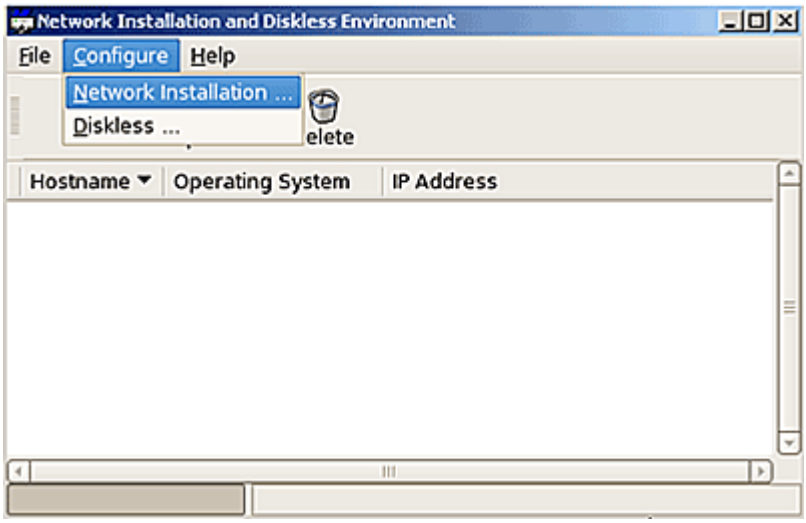

Figure B-1 Network Installation and Diskless Environment Window

2. The Configure Network Installations window is displayed. Click **Add**.

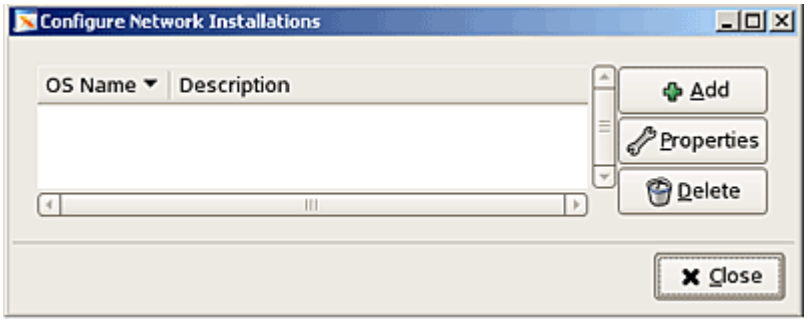

Figure B-2 Configure Network Installations Window

3. The Network Installation Dialog window is displayed.

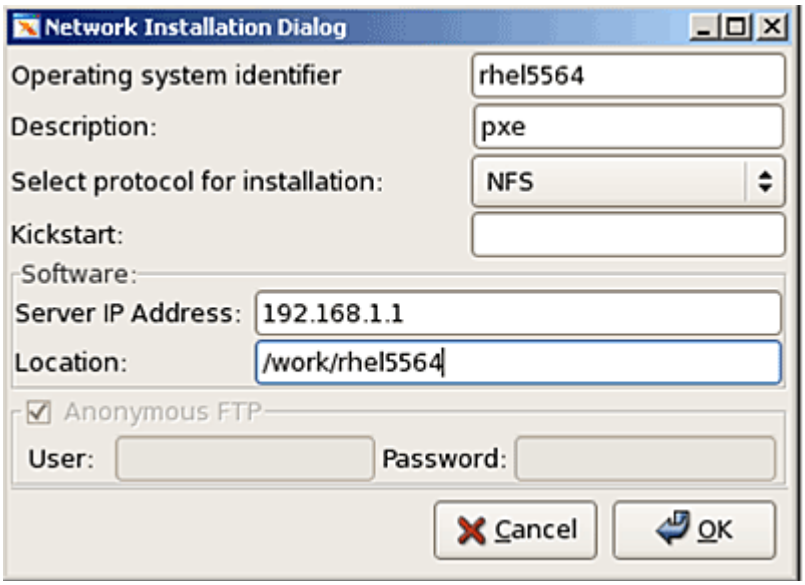

Figure B-3 Network Installation Dialog Window

- Enter the operating system identifier and description.
- Select **pxe** as the protocol for installation.
- Enter the IP address of the TFTP server (as set up in the DHCP server configuration) in the server IP address field.
- Enter a directory location for the server.

The Network Installation and Diskless Environment window shows the IP address of the TFTP server.

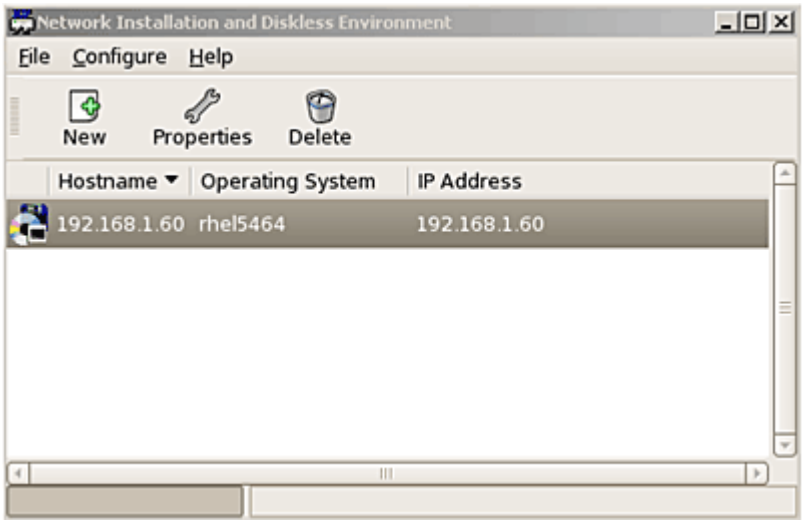

Figure B-4 Network Installation and Diskless Environment Window with IP Address

Configuring the Host

To configure the host:

1. Double-click on the IP address row in the Network Installation and Diskless Environment window (Figure B-4). An edit dialog box is displayed.

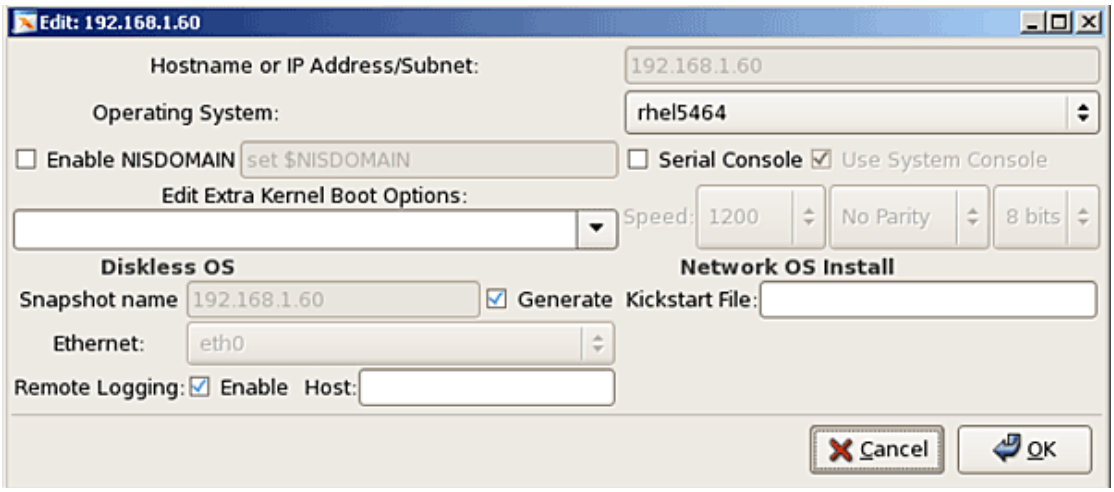

Figure B-5 Edit Dialog Box

2. In the Hostname or IP Address/Subnet field, enter the IP address, fully qualified hostname, or a subnet of systems that should be allowed to connect to the PXE server for installations. In Figure B-5, the Hostname/IP Address is the IP address of the client machine.
3. In the case of a multi-boot environment, select an operating system preference.

4. Select the operating system identifier to install on this client. The list is populated from the network install instances created from the Network Installation dialog box.
5. If you use a serial console, check the **Serial Console** check box.
6. Specify the location of a kickstart file, such as http://server.example.com/kickstart/ks.cfg. This file can be created with the Kickstart Configuration.

   Note: Ignore the Snapshot name and Ethernet options. They are only used for diskless environments.

7. Click **OK**. This closes the dialog box and creates configuration files within:
   `/tftpboot/linux-install and /tftpboot/linux-install/pxelinux.cfg`
8. Go to /tftpboot/pxelinux.cfg and open the file C0A8013C. The C0A8013C file is created when you assign the client IP using "system-config- netboot". This is the hexadecimal address of the IP assigned to the client NIC. It is 192.168.1.60 in the example in Figure B-4.

Enabling the PXE Client with a PXE-enabled Adapter

The PXE client must have a PXE-enabled adapter.

1. Power on the PXE client.
2. Press **<F12>** to enable network boot. Pressing **<F12>** accesses the DHCP server IP and the Boot Linux image.

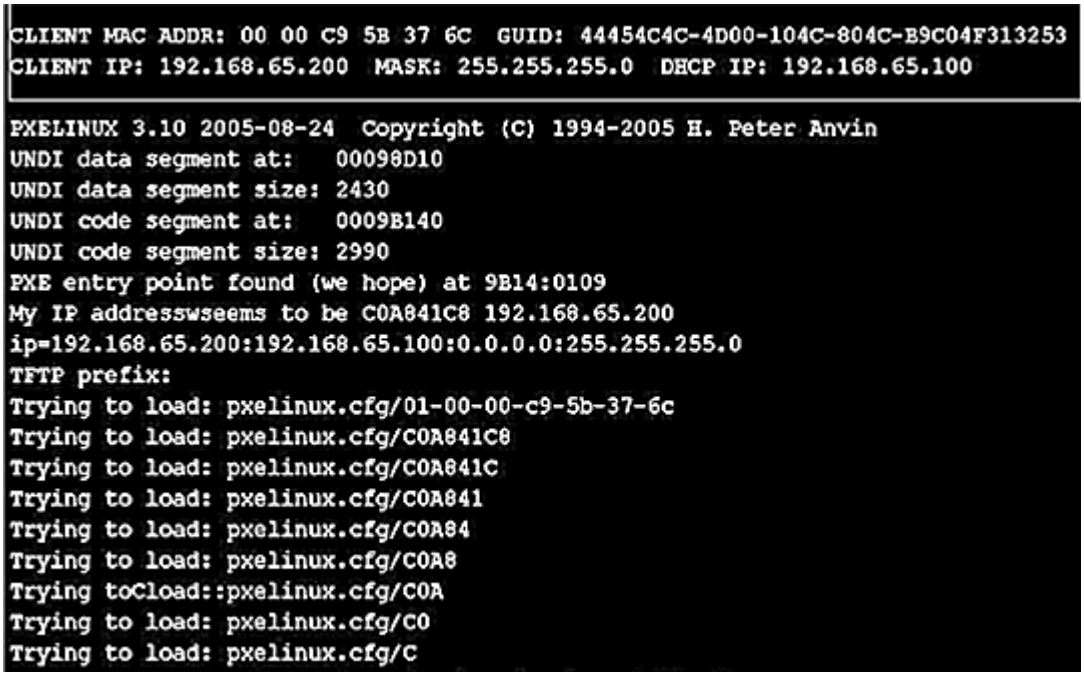
CLIENT MAC ADDR: 00 00 C9 5B 37 6C GUID: 44454C4C-4D00-104C-804C-B9C04F313253
CLIENT IP: 192.168.65.200 MASK: 255.255.255.0 DHCP IP: 192.168.65.100
PXELINUX 3.10 2005-08-24 Copyright (C) 1994-2005 H. Peter Anvin
UNDI data segment at: 00098D10
UNDI data segment size: 2430
UNDI code segment at: 0009B140
UNDI code segment size: 2990
PXE entry point found (we hope) at 9B14:0109
My IP addresswseems to be C0A841C8 192.168.65.200
ip=192.168.65.200:192.168.65.100:0.0.0.0:255.255.255.0
TFTP prefix:
Trying to load: pxelinux.cfg/01-00-00-c9-5b-37-6c
Trying to load: pxelinux.cfg/C0A841C8
Trying to load: pxelinux.cfg/C0A841C
Trying to load: pxelinux.cfg/C0A841
Trying to load: pxelinux.cfg/C0A84
Trying to load: pxelinux.cfg/C0A8
Trying toCload::pxelinux.cfg/C0A
Trying to load: pxelinux.cfg/C0
Trying to load: pxelinux.cfg/C

Figure B-6 Enabling Network Boot

Appendix C. Examples for Configuring and Booting UEFI NIC

UEFI NIC Server Configuration Script for SLES11 SPx

```
[root@orleansrhel5564 ~]# ls /root/sles11sp164/
SLES-11-SP1-DVD-x86_64-GM-DVD1.iso
[root@orleansrhel5564 ~]# mkdir test1
[root@orleansrhel5564 ~]# mkdir test2
[root@orleansrhel5564 ~]# mount -o loop
sles11sp164/SLES-11-SP1-DVD-x86_64-GM-DVD1.iso test1
[root@orleansrhel5564 ~]# ls test1
ARCHIVES.gz COPYING.degpg-pubkey-3d25d3d9-36e12d04.asc media.1
boot COPYRIGHT gpg-pubkey-7e2e3b05-4be037ca.asc NEWS
ChangeLog COPYRIGHT.degpg-pubkey-9c800aca-4be01999.asc pubring.gpg
content directory.yast gpg-pubkey-a1912208-446a0899.asc README
content.ascdocu gpg-pubkey-b37b98a9-4be01a1a.asc suse
content.keygpg-pubkey-0dfb3188-41ed929b.ascINDEX.gz
control.xmgpg-pubkey-1d061a62-4bd70bfa.asclicense.tar.gz
COPYING gpg-pubkey-307e3d54-4be01a65.ascls-lR.gz
[root@orleansrhel5564 ~]# mount -o loop test1/boot/x86_64/efi test2
[root@orleansrhel5564 ~]# ls -lar test2
total 28
-rwxr-xr-x 1 root root 48 May 20 2010 .packages.boot-efi
drwxr-xr-x 3 root root 2048 May 20 2010 efi
drwxr-x--- 20 root root 4096 Jan 5 14:04 ..
drwxr-xr-x 3 root root 16384 Jan 1 1970 .
[root@orleansrhel5564 ~]# ls -lar test2/efi/boot/
bootx64.efi elilo.conf initrd linux
[root@orleansrhel5564 ~]# ls -lar test2/efi/boot/
total 26838
-rwxr-xr-x 1 root root 3231872 May 20 2010 linux
-rwxr-xr-x 1 root root 23999623 May 20 2010 initrd
-rwxr-xr-x 1 root root 512 May 20 2010 elilo.conf
-rwxr-xr-x 1 root root 241318 May 20 2010 bootx64.efi
drwxr-xr-x 3 root root 2048 May 20 2010 ..
drwxr-xr-x 2 root root 2048 May 20 2010 .
[root@orleansrhel5564 ~]# cp test2/boot/efi/* /tftpboot/linux-install/
```

NFS Server Configuration Script

```
[root@bglinux156 ~]# /etc/rc.d/init.d/portmap restart
Stopping portmap: [ OK ]
Starting portmap: [ OK ]
[root@bglinux156 ~]# /etc/rc.d/init.d/nfslock restart
Stopping NFS locking: [ OK ]
Stopping NFS statd: [ OK ]
Starting NFS statd: [ OK ]
[root@bglinux156 ~]# /etc/rc.d/init.d/nfs restart
Shutting down NFS mountd: [ OK ]
Shutting down NFS daemon: [ OK ]
Shutting down NFS quotas: [ OK ]
Shutting down NFS services: [ OK ]
Starting NFS services:[ OK ]
Starting NFS quotas: [ OK ]
Starting NFS daemon: [ OK ]
Starting NFS mountd: [ OK ]
#### Check if the NFS services are running:
[root@bglinux156 ~]# rpcinfo -p
 program vers proto port
 100000 2 tcp 111 portmapper
 100000 2 udp 111 portmapper
 100021 1 udp 56782 nlockmgr
 100021 3 udp 56782 nlockmgr
 100021 4 udp 56782 nlockmgr
 100021 1 tcp 44855 nlockmgr
 100021 3 tcp 44855 nlockmgr
 100021 4 tcp 44855 nlockmgr
 100024 1 udp 766 status
 100024 1 tcp 769 status
 100011 1 udp 815 rquotad
 100011 2 udp 815 rquotad
 100011 1 tcp 818 rquotad
 100011 2 tcp 818 rquotad
 100003 2 udp 2049 nfs
 100003 3 udp 2049 nfs
 100003 4 udp 2049 nfs
 100003 2 tcp 2049 nfs
 100003 3 tcp 2049 nfs
 100003 4 tcp 2049 nfs
 100005 1 udp 828 mountd
```

```
100005 1 tcp 831 mountd
100005 2 udp 828 mountd
100005 2 tcp 831 mountd
100005 3 udp 828 mountd
```

DHCP Server Configuration

```
[root@orleansrhel5564 ~]# cat /etc/dhcpd.conf
```

1. Install the following RPMs in the server if not installed:

```
[root@bglinux156 ~]# rpm -qa | grep dhcp
dhcpv6-client-1.0.10-18.el5
dhcp-devel-3.0.5-23.el5
dhcp-3.0.5-23.el5
```

2. Make the following entry in /etc/dhcpd.conf file:

```
#
# DHCP Server Configuration file.
#      see /usr/share/doc/dhcp*/dhcpd.conf.sample
#

ddns-update-style interim;
#ignore client-updates;
subnet 192.168.47.0 netmask 255.255.255.0 {
range 192.168.47.50 192.168.47.100;
default-lease-time 3600;
max-lease-time-4800;
option subnet-mask 255.255.255.0;
option domain-name "pxe_test";
option time-offset -8; # Eastern Standard Time
}

# we want the nameserver to appear at a fixed address
 host orleansrhel5564 {
 next-server 192.168.47.1;#IP of the NFS Server
 hardware ethernet 00:00:c9:5b:a5:26;#mac address of
 #the client
#machine

 fixed-address 192.168.47.60; #IP assigned to the
 #client machine
 option host-name "linux-test";
 filename "bootx64.efi"; #Used for UEFI boot
 }

###This sets up a DNS server that will assign IP Address 192.168.47.60
###to the client machine that has MAC Address "00:00:c9:5b:a5:26"
###assigned to a PXE(UEFI) capable NIC
###The only thing that needs to be changed in the above, is the MAC
```

```
###Address to match that of the NIC in the client box
###The IP address that follows the next-server option should be the IP
###address of the tftp server
[root@bglinux156 ~]# service dhcpd restart
Shutting down dhcpd: [ OK ]
Starting dhcpd: [ OK ]
```

TFTP Server Setup

```
[root@orleansrhel5564 ~]# cat /etc/xinetd.d/tftp
service tftp
{
 disable = no
 socket_type = dgram
 protocol = udp
 wait= yes
 user = root
 server = /usr/sbin/in.tftpd
 server_args = -s /tftpboot/linux-install
 per_source = 11
 cps = 100 2
 flags = IPv4
```

UEFI NIC Server Configuration Script for RHEL 6.x

Setup Information

PXE client server: Dell R710 with Emulex OneConnect UCNA or Intel X520 card (Test System to do UEFI PXE boot)

PXE server: HP running RHEL 5.5 64 bit

NFS Configuration

```
[root@orleans ~]# mkdir /work
[root@orleans ~]# mount 10.192.194.110:/work /mnt   #### Mounting network drive
[root@orleans ~]# cd /mnt/
[root@orleans ~]# cp -r rhel6364/ /work/  #### Copying rhel6.1-64 bit os to PXE
server mechine
[root@orleans ~]# vim /etc/exports       ####(Add "/work    *(rw,sync)"
[root@orleans ~]#  exportfs -a           ####(reflect changes in NFS Server)


#### Restart NFS services
[root@orleans ~]#/etc/rc.d/init.d/portmap restart
[root@orleans ~]# /etc/rc.d/init.d/nfslock restart
[root@orleans ~]# /etc/rc.d/init.d/nfs restart
```

```
#### Check if NFS is running fine

[root@orleans ~]# rpcinfo -p

   program vers proto   port
    100000    2   tcp    111  portmapper
    100000    2   udp    111  portmapper
    100021    1   udp  56782  nlockmgr
    100021    3   udp  56782  nlockmgr
    100021    4   udp  56782  nlockmgr
    100021    1   tcp  44855  nlockmgr
    100021    3   tcp  44855  nlockmgr
    100021    4   tcp  44855  nlockmgr
    100024    1   udp    766  status
    100024    1   tcp    769  status
    100011    1   udp    815  rquotad
    100011    2   udp    815  rquotad
    100011    1   tcp    818  rquotad
    100011    2   tcp    818  rquotad
    100003    2   udp   2049  nfs
    100003    3   udp   2049  nfs
    100003    4   udp   2049  nfs
    100003    2   tcp   2049  nfs
    100003    3   tcp   2049  nfs
    100003    4   tcp   2049  nfs
    100005    1   udp    828  mountd
    100005    1   tcp    831  mountd
    100005    2   udp    828  mountd
    100005    2   tcp    831  mountd
    100005    3   udp    828  mountd
```

TFTP Configuration

```
[root@orleans ~]# vi /etc/xinted.d/tftp

# default: off
# description: The tftp server serves files using the trivial file transfer \
#       protocol.  The tftp protocol is often used to boot diskless \
#       workstations, download configuration files to network-aware printers, \
#       and to start the installation process for some operating systems.
service tftp
{
        disable                 = no
        socket_type             = dgram
        protocol                = udp
        wait                    = yes
        user                    = root
```

```
        server                  = /usr/sbin/in.tftpd
        server_args             = -s /tftpboot/linux-install
        per_source              = 11
        cps                     = 100 2
        flags                   = IPv4
}


##### Restart TFTP service

[root@orleans ~]# service xinetd restart
Stopping xinetd:                                   [  OK  ]
Starting xinetd:                                   [  OK  ]
[root@orleans ~]# chkconfig tftp on
```

PXE Configuration

```
[root@orleans ~]# cd /work/rhel6364/

[root@orleans RHEL6364]# cd images/pxeboot/

[root@orleans pxeboot]# cp -r * /tftpboot/linux-install/
#### Copy vmlinuz and initrd to TFTP root directory

[root@orleans pxeboot]# mkdir -p /root/test1

[root@orleans images]# cd /work/rhel6364/images/

[root@orleans images]# mount -o loop efiboot.img /root/test1     ###### Extract
efiboot.img to get bootx64.efi and BOOTX64.conf files

[root@orleans images]# cd /root/test1

[root@orleans test1]# cd efi/boot/

[root@orleans boot]# cp -r * /tftpboot/linux-install/   ###### Copy bootx64.efi
and BOOTX64.conf to TFTP root directory

#### Editing efidefault to the following content

[root@orleans boot]# cat /tftpboot/linux-install/efideault
default=0
timeout 10
splashimage=(nd)/splash.xpm.gz
title RHEL6364
        root (nd)
        splashimage /splash.xpm.gz
        kernel /vmlinuz keymap=us lang=en_US  method=nfs:192.168.1.1:/RHEL6364
ip=dhcp noipv6
```

```
        initrd /initrd.im
```

Configuring DHCP

```
[root@orleans ~]# cat  /etc/dhcpd.conf
#
# DHCP Server Configuration file.
#   see /usr/share/doc/dhcp*/dhcpd.conf.sample
ddns-update-style interim;
ignore client-updates;
#allow booting;
#allow bootp;
subnet 192.168.1.0 netmask 255.255.255.0 {
 range 192.168.1.50 192.168.1.90;
 default-lease-time 3600;
 max-lease-time 4800;
 option subnet-mask 255.255.255.0;
# option router 192.168.1.1;
 option domain-name "pxe_text";
# option name-server 192.168.1.20;
 option time-offset -8;
 }

host bglinux45{
  next-server 192.168.1.1;    #### IP address of PXE server interface connected
back to back to PXE client interface
  hardware ethernet 00:00:C9:BB:C7:8F;  #### MAC address of PXE client interface
  fixed-address 192.168.1.60;  #### IP address to be assigned to PXE client
interface
  option host-name "linux-test";
  filename "bootx64.efi";
 }

#### Restart DHCP service
[root@orleans ~]# service dhcpd restart
Shutting down dhcpd:                                [  OK  ]
Starting dhcpd:                                     [  OK  ]
```

Note: Reboot your system under test and boot from the PXE client interface.

Configuring the IBM HS22 Blade with e-Raptor MEZZ

To install and update the driver, follow these steps:

1. Press **<F1>** during the system boot and log into the System Configuration and Boot Management screen.

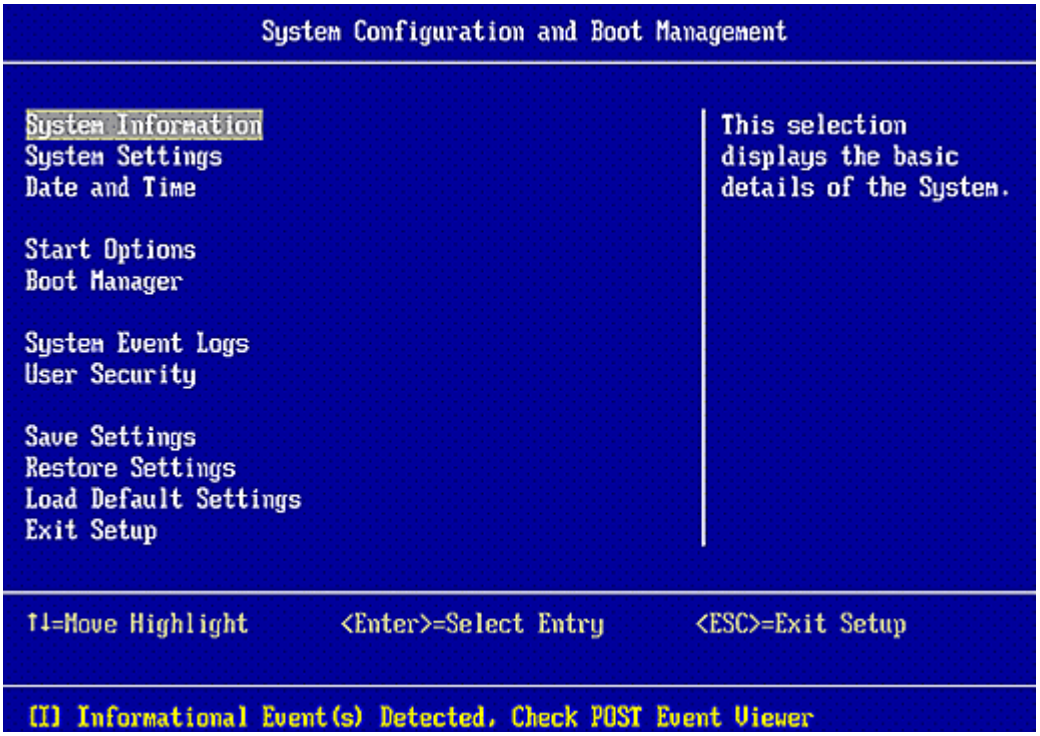

Figure C-1 System Configuration and Boot Management Screen

2. Select **Boot Manager** and press **<Enter>**. The Boot Manager screen is displayed.

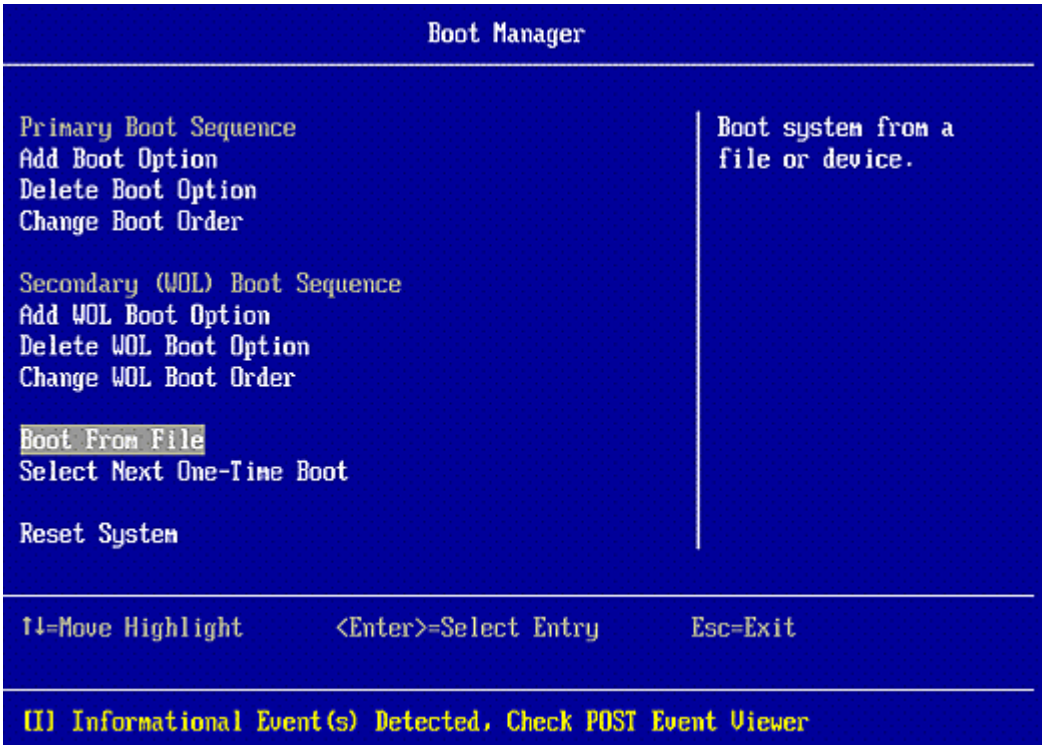

Figure C-2 Boot Manager Screen

3. Select **Boot from File** and press **<Enter>**. The File Explorer screen is displayed.

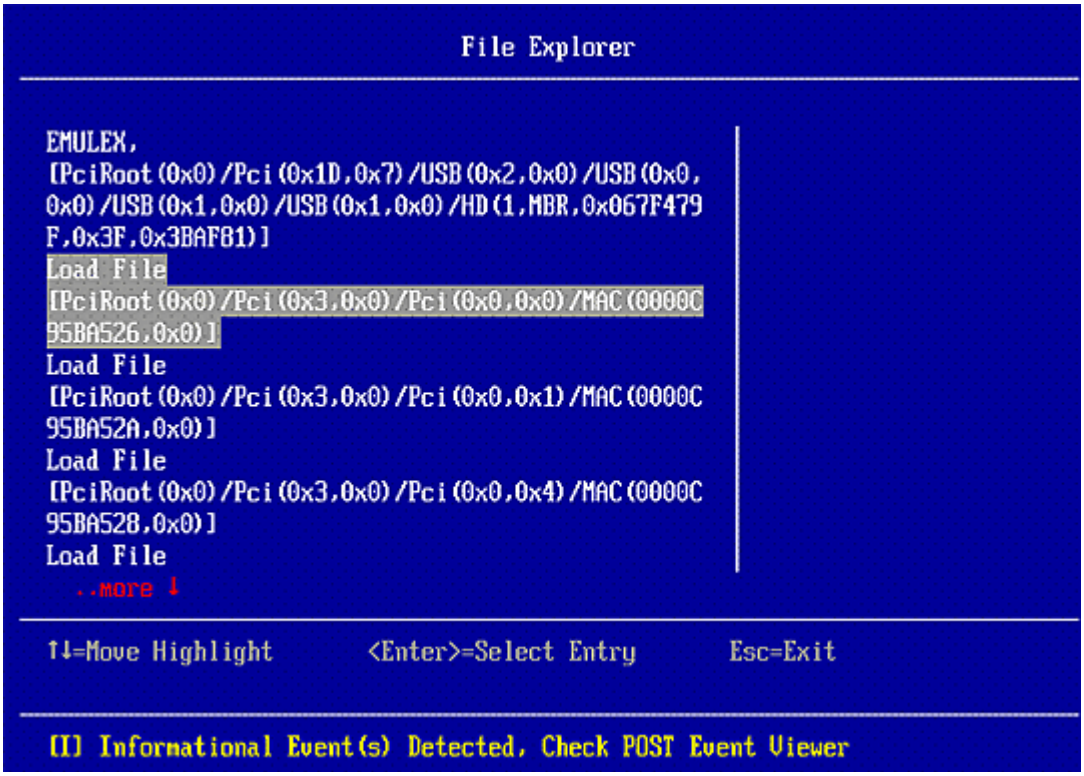

Figure C-3 File Explorer Screen

4. Select the card from which the UEFI NIC boot is to be performed. Press **<Enter>**. A message similar to the following is displayed.

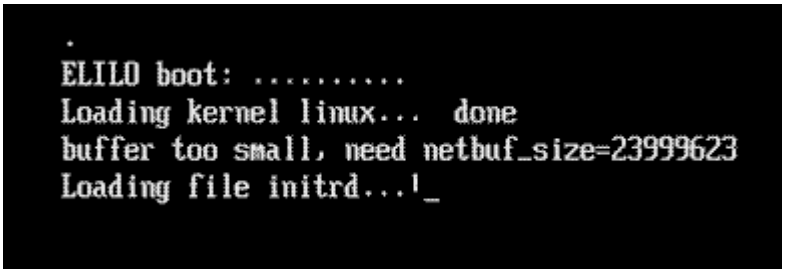

Figure C-4 ELILO Boot Message

5. The Language Selection menu is displayed. Select a language and click **OK**.

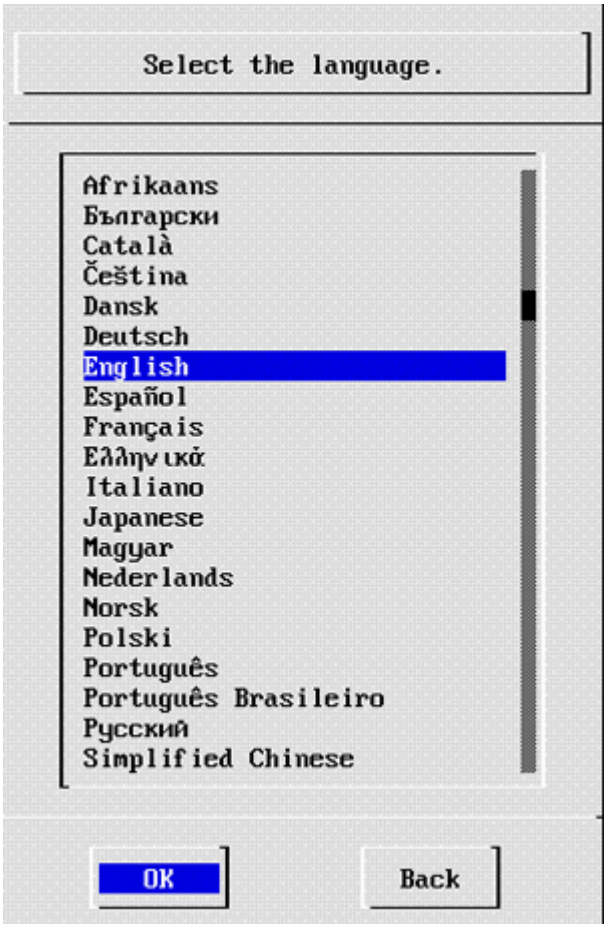

Figure C-5 Language Selection Menu

6. The Main menu is displayed. Select **Expert** and click **OK**.

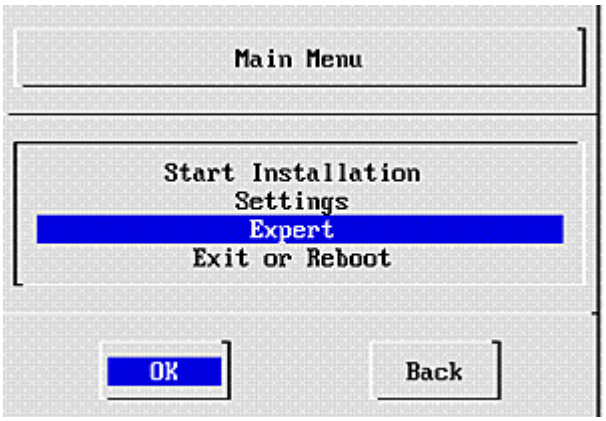

Figure C-6 Main Menu

7. The Expert menu is displayed. Select **Kernel Modules (Hardware Drivers)** and click **OK**.

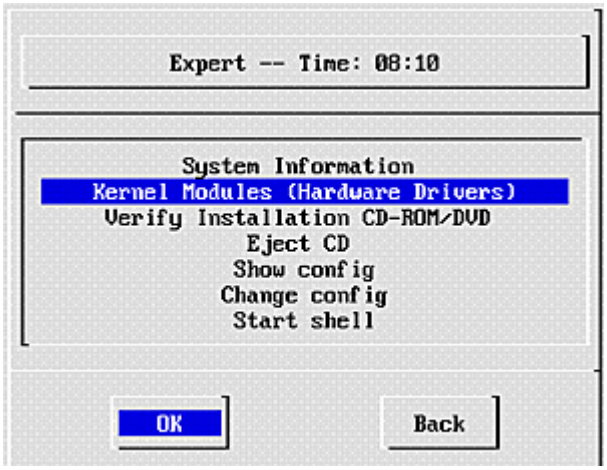

Figure C-7 Expert Menu

8. The Kernel Modules (Hardware Drivers) menu is displayed. Select **Add Driver Update** and click **OK**.

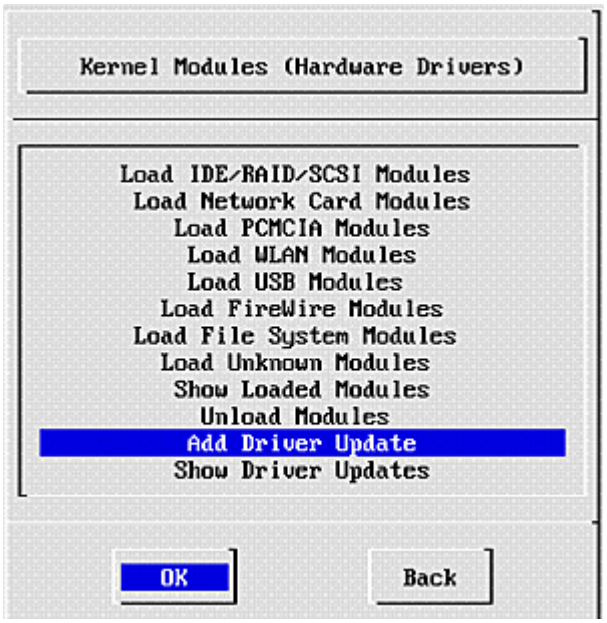

Figure C-8 Kernel Modules (Hardware Drivers) Menu

9. The Driver Update Medium Selection listing is displayed. Select a medium and click **OK**.

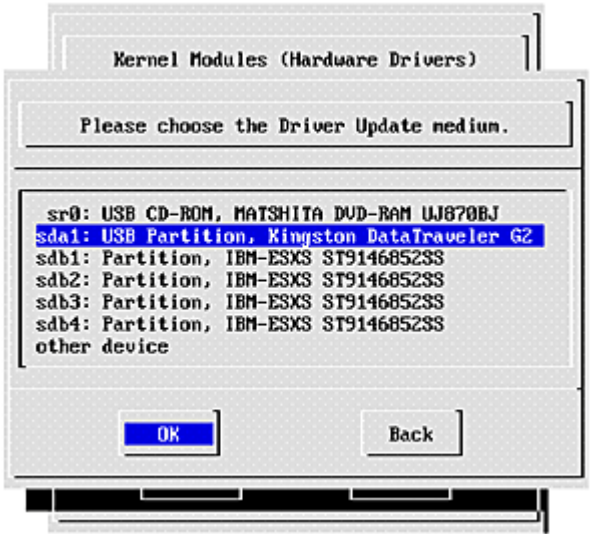
Kernel Modules (Hardware Drivers)
Please choose the Driver Update medium.
sr0: USB CD-ROM, MATSHITA DVD-RAM UJ870BJ
sda1: USB Partition, Kingston DataTraveler G2
sdb1: Partition, IBM-ESXS ST914685 2SS
sdb2: Partition, IBM-ESXS ST914685 2SS
sdb3: Partition, IBM-ESXS ST914685 2SS
sdb4: Partition, IBM-ESXS ST914685 2SS
other device
OK
Back

Figure C-9 Driver Update Medium Selection Listing

10. The Driver Update List confirmation dialog box is displayed. Click **OK**.

Figure C-10 Driver Update List Dialog Box

11. The Expert menu (Figure C-7) is displayed. Click **Back**.
12. The Main menu (Figure C-6) is displayed. Select **Start Installation** and click **OK**.
13. The Source Medium Selection menu is displayed. Select **Network** and click **OK**.

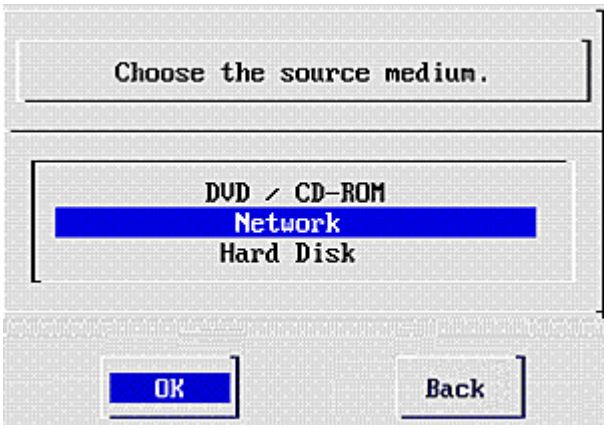

Figure C-11 Source Medium Selection Menu

14. The Network Protocol Selection menu is displayed. Select **NFS** and click **OK**.

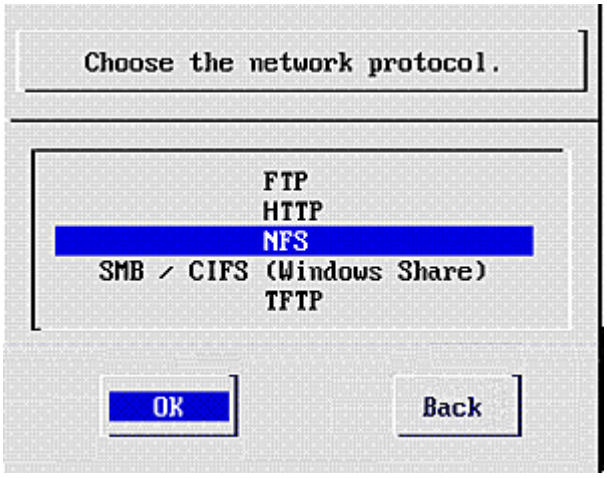

Figure C-12 Network Protocol Selection Menu

15. The Network Device Selection listing is displayed. Select the device and click **OK**.

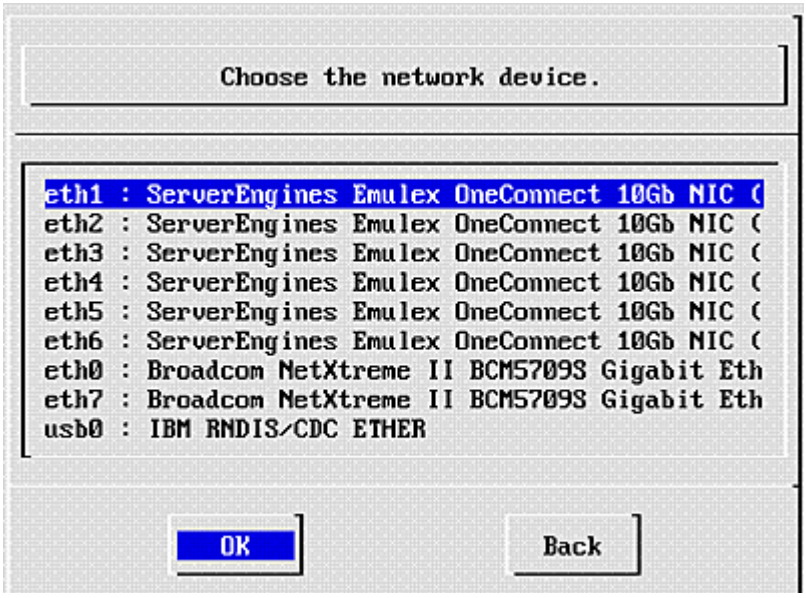
Choose the network device.
eth1 : ServerEngines Emulex OneConnect 10Gb NIC (
eth2 : ServerEngines Emulex OneConnect 10Gb NIC (
eth3 : ServerEngines Emulex OneConnect 10Gb NIC (
eth4 : ServerEngines Emulex OneConnect 10Gb NIC (
eth5 : ServerEngines Emulex OneConnect 10Gb NIC (
eth6 : ServerEngines Emulex OneConnect 10Gb NIC (
eth0 : Broadcom NetXtreme II BCM5709S Gigabit Eth
eth7 : Broadcom NetXtreme II BCM5709S Gigabit Eth
usb0 : IBM RNDIS/CDC ETHER
OK
Back

Figure C-13 Network Device Selection Listing

16. The DHCP request is sent. A dialog box prompts you to enter the IP address of the NFS server.

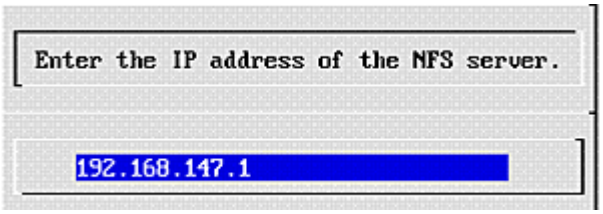

Figure C-14 NFS Server IP Address Dialog Box

17. Enter the IP address and press **<Enter>**. A dialog box prompts you to enter the directory path of the server.

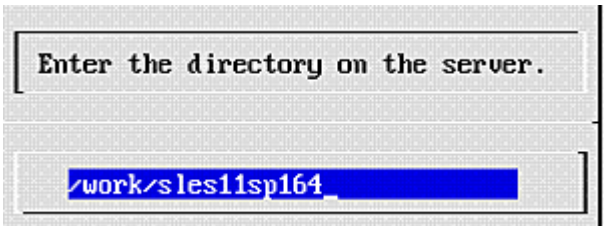

Figure C-15 Server Directory Dialog Box

18. Enter the directory path and press **<Enter>**. Information similar to the following is displayed.

Figure C-16 Starting Script

SUSE Linux Enterprise Server 11 Installation
- there are shells running on consoles 2, 5, 6, 9
- use 'extend' to load extensions (remove with 'extend -r'); extensions are:
o bind, gdb, sax2
- network setup: run, e.g. 'dhcpcd eth0'
- sshd: run 'rcsshd start' (don't forget to set a password with 'passwd')
/ # modinfo be2net
filename: /lib/modules/2.6.32.12-0.7-default/initrd/be2net.ko
supported: external
license: GPL
author: ServerEngines Corporation
description: ServerEngines BladeEngine 10Gbps NIC Driver 2.103.358.0
version: 2.103.358.0
srcversion: 7382DCFE6EFA5CA10009192
alias: pci:v000019A2d00000710sv*sd*bc*sc*i*
alias: pci:v000019A2d00000700sv*sd*bc*sc*i*
alias: pci:v000019A2d00000221sv*sd*bc*sc*i*
alias: pci:v000019A2d00000211sv*sd*bc*sc*i*
depends:
supported: yes
vermagic: 2.6.32.12-0.7-default SMP mod_unload modversions
parm: rx_frag_size:Size of receive fragment buffer - 2048 (default), 4096 or 819
parm: num_vfs:Number of PCI VFs to initialize (max 16) (uint)
parm: msix:Enable and disable the MSIx (By default MSIx is enabled) (uint)
parm: multi_rxq:Multi Rx Queue support. Enabled by default (uint)
/ #

Figure C-17 Driver Update Confirmation

UEFI NIC IPv6 PXE Setup Procedure for SLES11 SP2

Setup Information

PXE server: CISCO UCS C240 with SLES11 SP2 operating system

PXE client server: DELL R620 Server F6PCP adapter installed

PXE Server Setup

Launch 'yast2'

Configure Network Adapter

1. In the Network Devices section, select **Network Settings**.
2. Select the adapter port you wish the PXE server to use, then click **Edit**.
3. Select **Statically assigned IP Address** and enter the following settings:
   - IP Address: 192.168.1.1
   - Subnet Mask: /24
4. Under the Additional Addresses section, click **Add** to add an alias.
   - Alias Name: ipv6static
   - IP Address: fc00:ba49:1625:fb0f::137
   - Netmask: /64
5. Click **OK**.

Disable Firewall

1. In the Security and Users section, select **Firewall**.
2. Select **Disable Firewall Automatic Starting**.
3. Click **Stop Firewall Now**.

Install Services

1. In the Network Services section, select **DHCP Server**.
2. Choose to install and accept all defaults.
3. Install NFS server, TFTP server, and FTP server one by one by accepting all defaults.

Configure DHCPD6

```
Brussels-sles11sp2:~ # vim /etc/dhcpd6.conf

   default-lease-time 2592000;
   preferred-lifetime 604800;
   option dhcp-renewal-time 3600;
   option dhcp-rebinding-time 7200;
   allow leasequery;
   option dhcp6.name-servers fc00:ba49:1625:fb0f::1;
   option dhcp6.domain-search "pxetest.org";
   option dhcp6.info-refresh-time 21600;
   option dhcp6.bootfile-url code 59 = string;
   # The subnet where the server is attached
   # (i.e., the server has an address in this subnet)
   subnet6 fc00:ba49:1625:fb0f::/64 {
   option dhcp6.bootfile-url "tftp://[fc00:ba49:1625:fb0f::137]/bootx64.efi";
   # Nine addresses available to clients
   # (the tenth client should get NoAddrsAvail)
   range6 fc00:ba49:1625:fb0f::42:10 fc00:ba49:1625:fb0f::42:99;
   # Use the whole /64 prefix for temporary addresses
   # (i.e., direct application of RFC 4941)
   range6 fc00:ba49:1625:fb0f:: temporary;
   }
```

Edit /etc/sysconfig/dhcpd and verify DHCPD6_INTERFACE is set to the network adapter port on which you want the DHCP server to listen.

```
   DHCPD6_INTERFACE="ethx"
```

Configure TFTP

```
Brussels-sles11sp2:~ # vim  /etc/xinetd.d/tftp
   # default: off
   # description: tftp service is provided primarily for booting or when a \
   #      router need an upgrade. Most sites run this only on machines acting as
   #       "boot servers".
   service tftp
   {
           socket_type     = dgram
           protocol        = udp
           wait            = yes
           flags           = IPv6 IPv4
           user            = root
           server          = /usr/sbin/in.tftpd
           server_args     =  -s /tftpboot
           disable         = no
           per_source      = 11
           cps             = 100 2
   }
```

Configure ELILO Boot Loader

Retrieve ELILO from the installation DVD and create a configuration file:

1. Place the first SUSE Linux Enterprise Server install DVD in your DVD drive of the PXE Server.
2. Open a root terminal.
3. Mount the boot image and copy the contents.

```
Brussels-sles11sp2:~ # mkdir /tmp/efi-img
Brussels-sles11sp2:~ # mount -o loop /media/<name of disc>/boot/x86_64/efi
/tmp/efi-img
Brussels-sles11sp2:~ #  cp /tmp/efi-img/efi/boot/*   /tftpboot
```

Create /tftpboot/elilo.conf with the Following Contents

```
Brussels-sles11sp2:~ # vim  /tftpboot/elilo.conf
prompt
   timeout=50
   delay=100
image=/linux
   label=suse
   initrd=/initrd
   append="install=ftp://[fc00:ba49:1625:fb0f::137]/sles  ipv6only=1  sysrq=1
   dd  vga=791 manual=1 textmode=0 showopts"
```

Copy Installation Files for FTP Transfer

```
Brussels-sles11sp2:~ #  cd   /media/<name of disc>
Brussels-sles11sp2:~ #  mkdir   /srv/ftp/sles
Brussels-sles11sp2:~ #  cp -r *  /srv/ftp/sles
```

Configure FTP to Enable Support for IPv6

```
Brussels-sles11sp2:~ # vim     /etc/vsftpd.conf
   # Activate directory messages - messages given to remote users when they
   # go into a certain directory.
   #
   dirmessage_enable=YES
   #
   # It is recommended that you define on your system a unique user which the
   # ftp server can use as a totally isolated and unprivileged user.
   #
   nopriv_user=ftpsecure
   #
   # You may fully customise the login banner string:
   #
   #ftpd_banner="Welcome to FOOBAR FTP service."
   #
   # You may activate the "-R" option to the builtin ls. This is disabled by
   # default to avoid remote users being able to cause excessive I/O on large
```

```
# sites. However, some broken FTP clients such as "ncftp" and "mirror" assume
# the presence of the "-R" option, so there is a strong case for enabling it.
#
#ls_recurse_enable=YES
#
# You may specify a file of disallowed anonymous e-mail addresses. Apparently
# useful for combatting certain DoS attacks.
#
#deny_email_enable=YES
#
# (default follows)
#
#banned_email_file=/etc/vsftpd.banned_emails
#
# If  enabled,  all  user  and  group  information in
# directory listings will be displayed as "ftp".
#
#hide_ids=YES

# Local FTP user Settings
#
# Uncomment this to allow local users to log in.
#
#local_enable=YES
#
# Default umask for local users is 077. You may wish to change this to 022,
# if your users expect that (022 is used by most other ftpd's)
#
#local_umask=022
#
# Uncomment to put local users in a chroot() jail in their home directory
# after login.
#
#chroot_local_user=YES
#
# You may specify an explicit list of local users to chroot() to their home
# directory. If chroot_local_user is YES, then this list becomes a list of
# users to NOT chroot().
#
#chroot_list_enable=YES
#
# (default follows)
#
#chroot_list_file=/etc/vsftpd.chroot_list
#
# The maximum data transfer rate permitted, in bytes per second, for
# local authenticated users. The default is 0 (unlimited).
#
```

```
#local_max_rate=7200
# Anonymus FTP user Settings
#
# Allow anonymous FTP?
#
anonymous_enable=YES
#
# Anonymous users will only be allowed to download files which are
# world readable.
#
anon_world_readable_only=YES
#
# Uncomment this to allow the anonymous FTP user to upload files. This only
# has an effect if the above global write enable is activated. Also, you will
# obviously need to create a directory writable by the FTP user.
#
anon_upload_enable=YES
#
# Default umask for anonymus users is 077. You may wish to change this to 022,
# if your users expect that (022 is used by most other ftpd's)
#
#anon_umask=022
#
# Uncomment this if you want the anonymous FTP user to be able to create
# new directories.
#
anon_mkdir_write_enable=YES
#
# Uncomment this to enable anonymus FTP users to perform other write
operations
# like deletion and renaming.
#
anon_other_write_enable=YES
#
# If you want, you can arrange for uploaded anonymous files to be owned by
# a different user. Note! Using "root" for uploaded files is not
# recommended!
#
#chown_uploads=YES
#chown_username=whoever
#
# The maximum data transfer rate permitted, in bytes per second, for anonymous
# authenticated users. The default is 0 (unlimited).
#
#anon_max_rate=7200
# Log Settings
#
# Log to the syslog daemon instead of using an logfile.
```

```
#
syslog_enable=YES
#
# Uncomment this to log all FTP requests and responses.
#
#log_ftp_protocol=YES
#
# Activate logging of uploads/downloads.
#
#xferlog_enable=YES
#
# You may override where the log file goes if you like. The default is shown
# below.
#
#vsftpd_log_file=/var/log/vsftpd.log
#
# If you want, you can have your log file in standard ftpd xferlog format.
# Note: This disables the normal logging unless you enable dual_log_enable
below.
#
#xferlog_std_format=YES
#
# You may override where the log file goes if you like. The default is shown
# below.
#
#xferlog_file=/var/log/xferlog
#
# Enable this to have booth logfiles. Standard xferlog and vsftpd's own style
log.
#
#dual_log_enable=YES
#
# Uncomment this to enable session status information in the system process
listing.
#
#setproctitle_enable=YES
# Transfer Settings
#
# Make sure PORT transfer connections originate from port 20 (ftp-data).
#
connect_from_port_20=YES
#
# You may change the default value for timing out an idle session.
#
#idle_session_timeout=600
#
# You may change the default value for timing out a data connection.
#
#data_connection_timeout=120
```

```
#
# Enable this and the server will recognise asynchronous ABOR requests. Not
# recommended for security (the code is non-trivial). Not enabling it,
# however, may confuse older FTP clients.
#
#async_abor_enable=YES
#
# By default the server will pretend to allow ASCII mode but in fact ignore
# the request. Turn on the below options to have the server actually do ASCII
# mangling on files when in ASCII mode.
# Beware that turning on ascii_download_enable enables malicious remote
parties
# to consume your I/O resources, by issuing the command "SIZE /big/file" in
# ASCII mode.
# These ASCII options are split into upload and download because you may wish
# to enable ASCII uploads (to prevent uploaded scripts etc. from breaking),
# without the DoS risk of SIZE and ASCII downloads. ASCII mangling should be
# on the client anyway..
#
#ascii_upload_enable=YES
#ascii_download_enable=YES
#
# Set to NO if you want to disallow the  PASV  method of obtaining a data
# connection.
#
#pasv_enable=NO
# PAM setting. Do NOT change this unless you know what you do!
#
pam_service_name=vsftpd
# Set to ssl_enable=YES if you want to enable SSL
ssl_enable=NO
# Limit passive ports to this range to assis firewalling
pasv_min_port=30000
pasv_max_port=30100
anon_mkdir_write_enable=YES
anon_root=/srv/ftp
anon_upload_enable=YES
chroot_local_user=NO
ftpd_banner=Welcome message
idle_session_timeout=900
local_enable=YES
log_ftp_protocol=YES
max_clients=10
max_per_ip=3
pasv_enable=YES
ssl_sslv2=NO
ssl_sslv3=NO
ssl_tlsv1=YES
```

```
write_enable=YES
listen=NO
listen_ipv6=YES
```

Restart the Necessary Services

```
Service nfsserver restart
Service xinetd restart
Service vsftpd restart
Service dhcpd6 restart
```

PXE Client Setup

To set up the PXE client:

1. Boot the server and press **<F2>** to enter system setup.
2. Select System BIOS Settings > Boot Settings and change boot mode to UEFI.
3. Reboot the server.
4. Press **<F2>** to enter system setup.
5. Select System BIOS Settings > Boot Settings > UEFI Boot Settings and set the UEFI PXE boot protocol to IPv6.

System Setup
System BIOS
System BIOS Settings • Boot Settings • UEFI Boot Settings
Integrated NIC 1 Port 1: EFI Network 1
Integrated NIC 1 Port 2: EFI Network 2
Integrated NIC 1 Port 3: EFI Network 3
Integrated NIC 1 Port 4: EFI Network 4
Boot Option Enable/Disable
Integrated RAID Controller 1: SUSE Linux Enterprise Server 11 SP2
Embedded SATA Port Optical Drive E: HL-DT-ST DVD-ROM DU60N
Disk connected to back USB 1: Cruzer Pop
Integrated NIC 1 Port 1: EFI Network 1
Integrated NIC 1 Port 2: EFI Network 2
Integrated NIC 1 Port 3: EFI Network 3
Integrated NIC 1 Port 4: EFI Network 4
UEFI PXE boot protocol
IPv4
IPv6

Figure C-18 UEFI Boot Settings Screen

6. Reboot the server.

7. Press **<F11>** and enter the UEFI boot manager. The Boot Manager Main Menu is displayed.

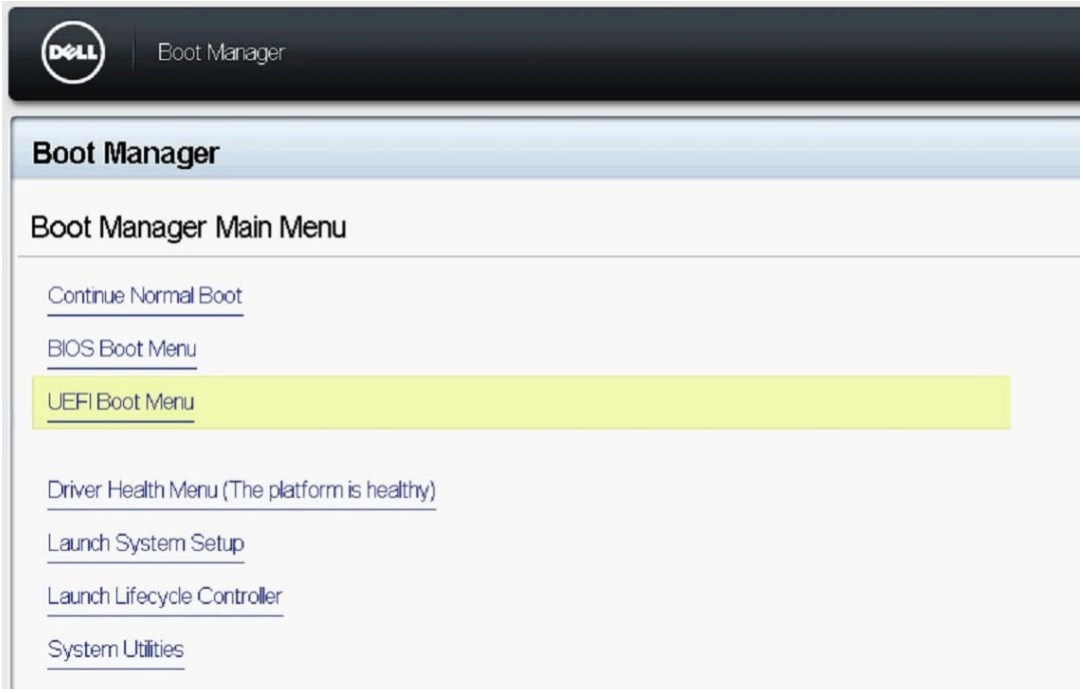

Figure C-19 Boot Manager Main Menu

8. Select **UEFI Boot Menu**. The UEFI Boot Menu is displayed.

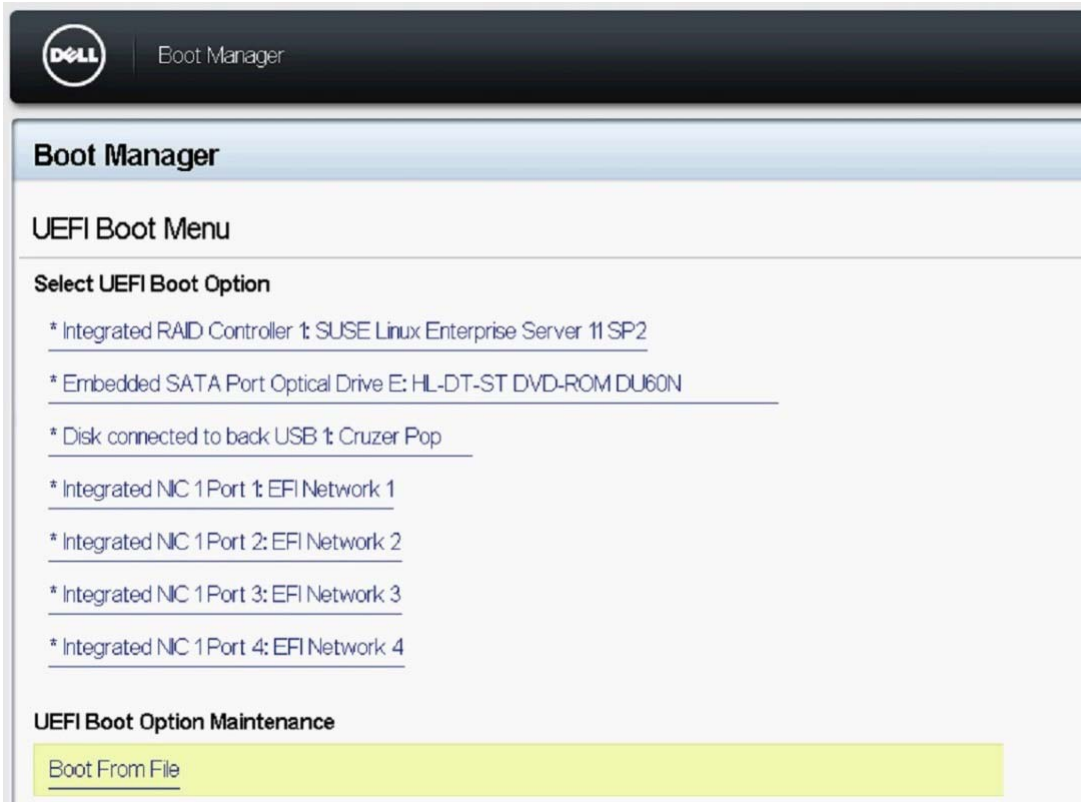
Boot Manager
Boot Manager
UEFI Boot Menu
Select UEFI Boot Option
* Integrated RAID Controller 1: SUSE Linux Enterprise Server 11 SP2
* Embedded SATA Port Optical Drive E: HL-DT-ST DVD-ROM DU60N
* Disk connected to back USB 1: Cruzer Pop
* Integrated NIC 1 Port 1: EFI Network 1
* Integrated NIC 1 Port 2: EFI Network 2
* Integrated NIC 1 Port 3: EFI Network 3
* Integrated NIC 1 Port 4: EFI Network 4
UEFI Boot Option Maintenance
Boot From File

Figure C-20 UEFI Boot Menu

9. Select **Boot From File**. The File Explorer screen is displayed.

Boot Manager
File Explorer
File Explorer
*[NO VOLUME LABEL] Integrated RAID Controller 1
*[RAHUL] Disk connected to back USB 1: Cruzer Pop
*[Load File] Integrated NIC 1 Port 1:
*[Load File] Integrated NIC 1 Port 2:
*[Load File] Integrated NIC 1 Port 3:
*[Load File] Integrated NIC 1 Port 4:

Figure C-21 File Explorer Screen

10. Select the port on the client through which PXE boot must be performed and press **<Enter>**. A status message is displayed and then the Language Selection menu is displayed.

Figure C-22 Language Selection Menu

11. Select a language and click **OK**. The Main Menu is displayed.

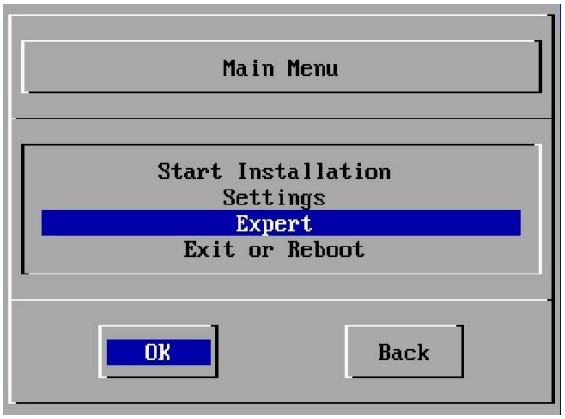

Figure C-23 Main Menu

12. Select **Expert** and click **OK**. The Expert menu is displayed.

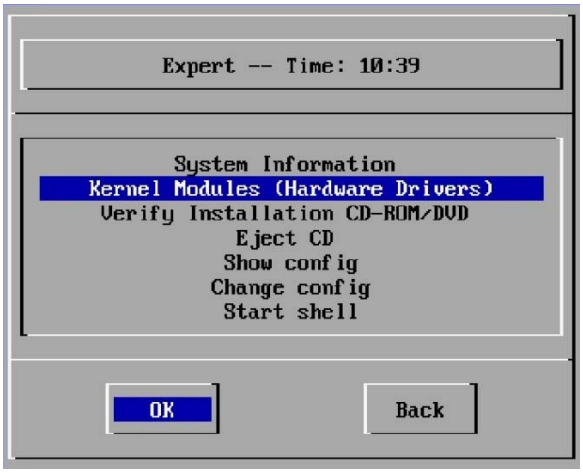

Figure C-24 Expert Menu

13. Select **Kernel Modules (Hardware Drivers)** and click **OK**. The Kernel Modules (Hardware Drivers) menu is displayed.

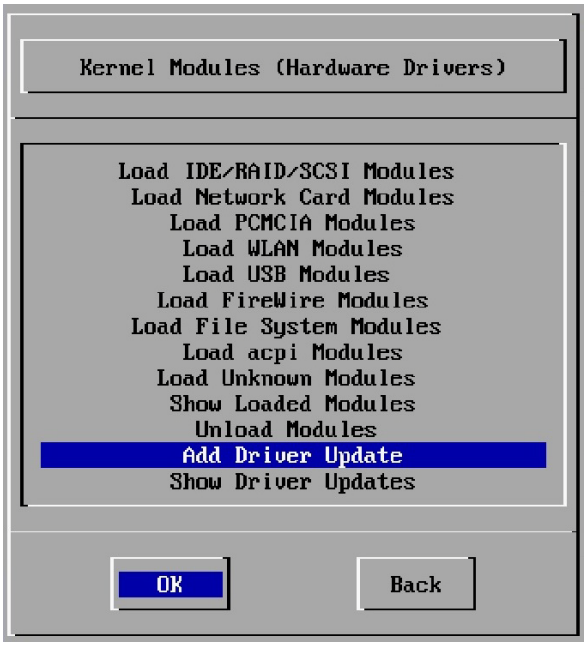

Figure C-25 Kernel Modules (Hardware Drivers) Menu

14. Select **Add Driver Update** and click **OK**. The Driver Update Medium Selection list is displayed.

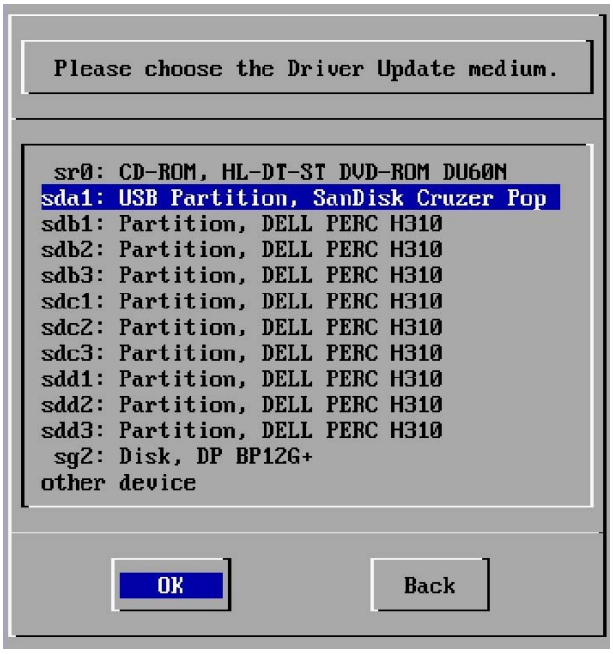
Please choose the Driver Update medium.
sr0: CD-ROM, HL-DT-ST DVD-ROM DU60N
sda1: USB Partition, SanDisk Cruzer Pop
sdb1: Partition, DELL PERC H310
sdb2: Partition, DELL PERC H310
sdb3: Partition, DELL PERC H310
sdc1: Partition, DELL PERC H310
sdc2: Partition, DELL PERC H310
sdc3: Partition, DELL PERC H310
sdd1: Partition, DELL PERC H310
sdd2: Partition, DELL PERC H310
sdd3: Partition, DELL PERC H310
sg2: Disk, DP BP12G+
other device
OK
Back

Figure C-26 Driver Update Medium Selection List

15. Select a medium from the list and click **OK**. The Expert menu (Figure C-24) is displayed.
16. Click **Back**. The Main Menu (Figure C-23) is displayed.
17. Select **Start Installation** and click **OK**. The Source Medium list is displayed.

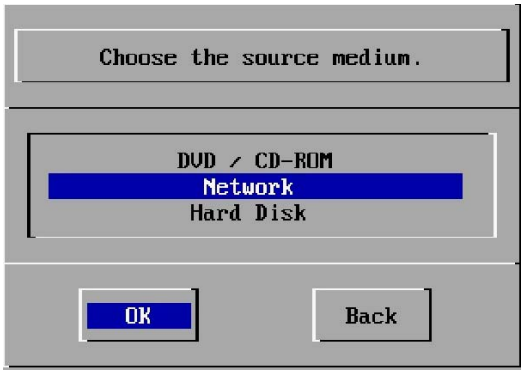

Figure C-27 Source Medium List

18. Select **Network** and click **OK**. The Network Protocol list is displayed.

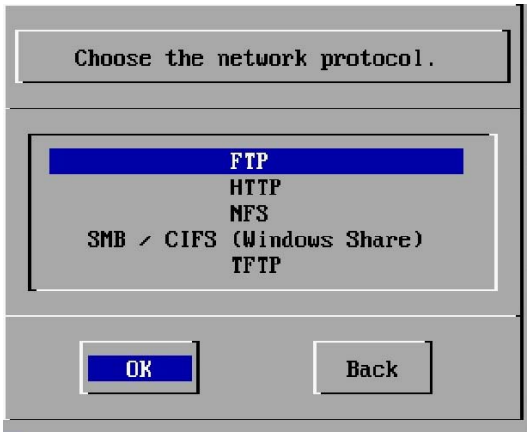

Figure C-28 Network Protocol List

19. Select **FTP** and click **OK**. The Network Device list is displayed.

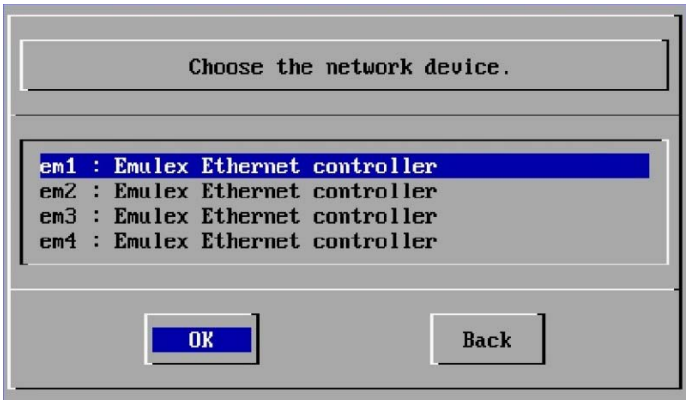

Figure C-29 Network Device List

20. Select the device and click **OK**. A dialog box prompts you for automatic configuration via DHCP.

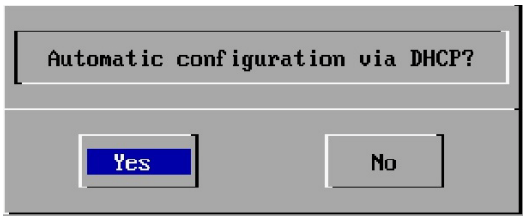

Figure C-30 Automatic Configuration via DHCP Dialog Box

21. Click **Yes**. The DHCP6 request is sent. A dialog box prompts you to enter the IPv6 address of the FTP server.

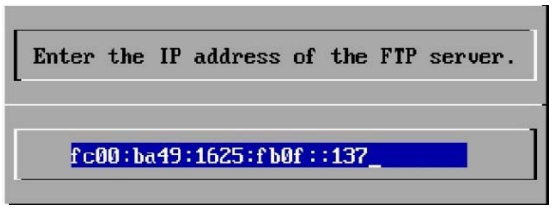

Figure C-31 FTP Server IPv6 Address Dialog Box

22. Enter the IPv6 address and press <Enter>. A dialog box prompts you to enter the directory path of the server.

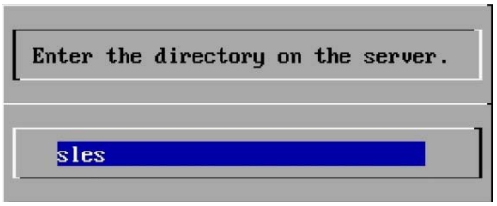

Figure C-32 Server Directory Path Dialog Box

23. Enter the server's directory path and press <Enter>. A pop-up will appear if you must enter a username and password for the FTP server.
24. Select **NO** for this selection and select **NO** for using HTTP Proxy. The installation begins and the License Agreement page is displayed.
25. Once you accept the license agreement, all of the operating system packages are downloaded via FTP over IPv6.

Appendix D. Example for Installing and Booting UEFI FCoE

The following steps use the Linux SLES operating system as an example.

1. Boot to UEFI linux from DVD.
2. Select UEFI boot from the BIOS boot manager or boot to shell and execute /efi/boot/elilo.efi from removable media.
3. Follow normal boot instructions from YaST.
4. During the Installation Settings, select **Partitioning**, then select **Custom partitioning (for experts)**.
5. In **SystemViews**, select a hard disk.
6. Select the **Partitions** tab.
7. Delete any old partitions on the disk.
8. To create a GPT disklabel (UEFI does not support booting from disks with an MS-DOS partition table), click **Expert** (above the Accept button).
9. Create a partition table and check GPT (required for UEFI boot).

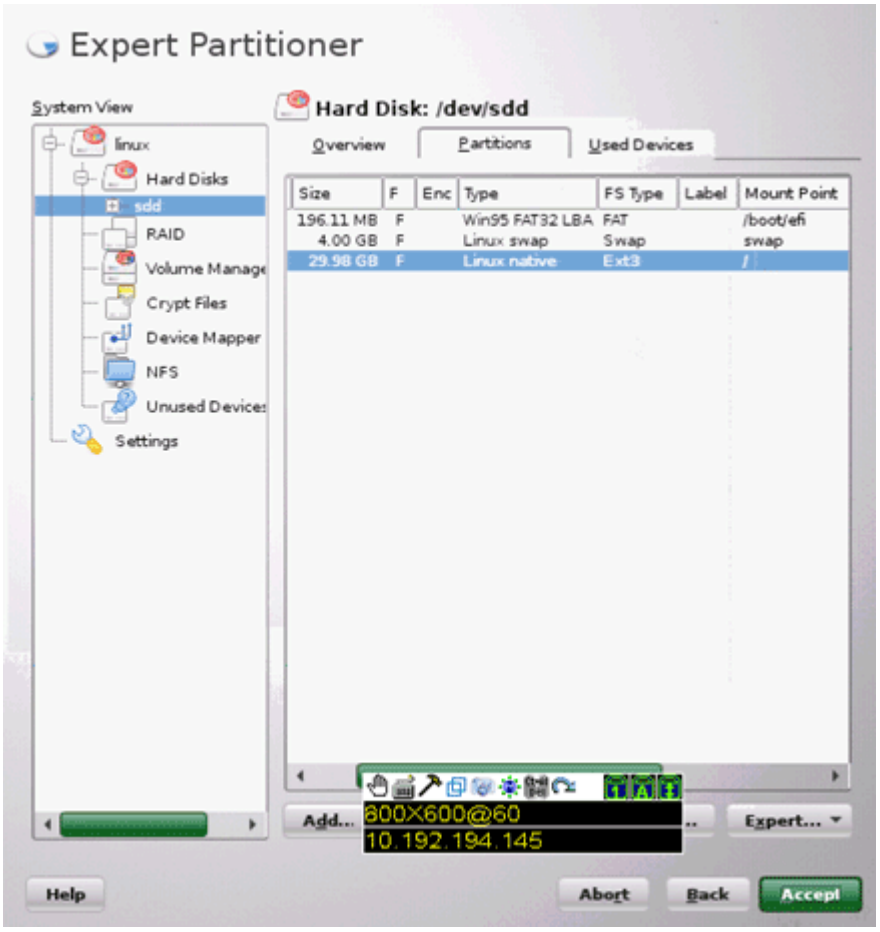

Figure D-1 Partitions Tab

10. To add an UEFI system partition (VFAT or FAT), click **Add**.
11. Select a custom size (100-400MB) depending on what EFI driver and utilities you want to store on the UEFI system partition. In general, using 200 MB is sufficient if the plug-in card detail for UEFI system partition is unknown.
12. In the Formatting options dialog box, select **Format Partition > File system > FAT**.
13. Under Mounting options, select **/boot/efi** and click **Finish**. The boot drive now has a GPT disk label that contains a FAT EFI boot partition.
14. Perform the remainder of the partitioning as with any Linux installation. The remainder of the installation is not unique to UEFI, for example, add a swap partition and an EXT3 partition for root.
15. Once the installation is completed, view the partitions using the `parted -l` command. Information similar to the following is displayed:

```
/ # parted -1
Model : SEAGATE ST336754FC (scsi)
Disk /dev/sdd: 36.7GB
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Number Start    End      Size   File system Name     Flags
1      17.4kB   206MB    206MB  fat16       primary  , , , , , , , , , , , ,
nsftres
2      206MB    4499MB   4294MB linux-swap  primary  , , , , , , , , , , , ,
3      4499MB   31.36GB  26.8GB ext3        primary  , , , , , , , , , , , ,
```

16. When the system boots, SUSE Linux Enterprise Server 11 SP1 now shows in the system Start Options screen.

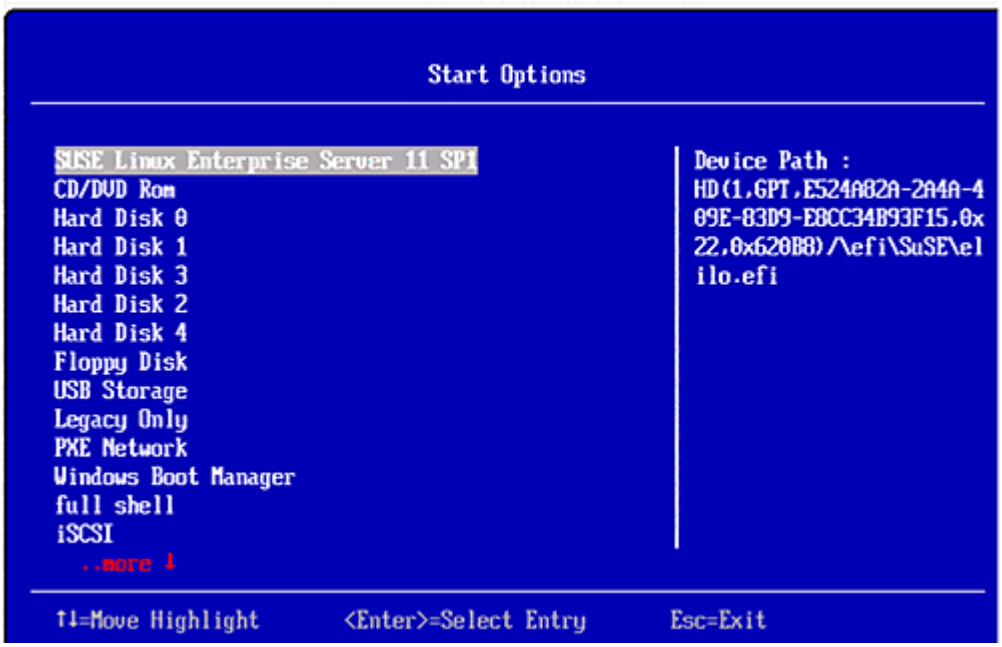

Figure D-2 UEFI FCoE Start Options

Appendix E. Loading and Unloading UEFIBoot from the UEFI Shell

Loading UEFIBoot from the UEFI Shell

The UEFI boot code is distributed with the firmware in a .UFI file. This file may be downloaded to a NIC, iSCSI, or FCoE adapter through the HII interface in the NIC UEFI code.

Unloading UEFIBoot from the UEFI Shell

To unload UEFIBoot:

1. View Emulex driver handle information by typing "`drivers`" and pressing **<Enter>** at the shell prompt. A list of drivers is displayed.

```
E1 0000000A B - -  2  3 Partition Driver(MBR/GPT/El Torito) FvFile(43B93232-AF
E2 0000000A B - -  1 48 PCI Bus Driver                      FvFile(93B80004-9F
E7 0000000A D - -  1  - SCSI Bus Driver                     FvFile(0167CCC4-D0
E8 0000000A ? - -  -  - Scsi Disk Driver                    FvFile(0A66E322-37
EF 00000001 D - -  1  - Vitesse VSC452 SIO Driver           FvFile(BBA81468-FF
F1 0000000A D - -  4  - Simple Network Protocol Driver      FvFile(A2F436EA-A1
F2 0000000A D - - 16  - UEFI PXE Base Code Driver           FvFile(3B1DEAB5-C7
F4 0000000A D - -  4  - PXE DHCPv4 Driver                   FvFile(A46C3330-BE
F5 0000000A B - -  4 12 MNP Network Service Driver          FvFile(025BBFC7-E6
F6 0000000A B - -  4 28 IP4 Network Service Driver          FvFile(9FB1A1F3-3B
F7 0000000A B - -  4  4 DHCP Protocol Driver                FvFile(94734718-0B
F8 0000000A D - -  4  - IP4 CONFIG Network Service Driver   FvFile(26841BDE-92
F9 0000000A D - -  4  - Tcp Network Service Driver          FvFile(6D6963AB-90
FA 0000000A B - - 24 20 UDP Network Service Driver          FvFile(6D6963AB-90
FB 0000000A D - -  4  - ARP Network Service Driver          FvFile(529D3F93-E8
FC 0000000A B - -  8  4 MTFTP4 Network Service              FvFile(DC3641B8-2F
FD 0000000A ? - -  -  - UEFI PXE Configuration Driver       FvFile(0C086DB5-AA
11C 00050212 B X X  1  1 Broadcom Gigabit Ethernet Driver    Offset(12000,231FF
11E 00050212 B X X  1  1 Broadcom Gigabit Ethernet Driver    Offset(12000,231FF
122 000221A5 B - X  2  2 Emulex 10G NIC                      Offset(8000,169FF)
126 000100AF D - -  2  - Emulex iSCSI Boot Driver            Offset(10000,1A5FF
143 030A0001 D X X  1  - LSI Logic Fusion MPT SAS Driver     Offset(B200,247FF)
147 00000019 ? - -  -  - G200eV Matrox Graphics UEFI Driver  Offset(8000,D1FF)
```

Figure E-1 Driver Listing

2. Write down the Emulex NIC, FCoE or iSCSI driver handles. For the above case, the Emulex NIC driver handle is 122 and the Emulex iSCSI driver handle is 126.
3. To unload the Emulex NIC driver in the previous example, type "`unload 122`" and press **<Enter>**.
4. To unload the Emulex iSCSI driver in the previous example, type "`unload 126`" and press **<Enter>**.

Appendix F. Dell UEFI

The following sections define and describe the fields and configuration settings for Dell adapters using the Dell UEFI utility.

The Dell UEFI adapter configuration utility is a unified configuration utility that enables you to configure all of the available protocols through a single GUI interface, unlike individual configuration utilities. The iSCSI and FCoE configuration can be configured using these menus even when those functions are not physically present. The configuration will be applied once those respective functions are enabled.

Accessing the Main Configuration Page

From the System Setup > Device Settings page, select the adapter that you want to view.

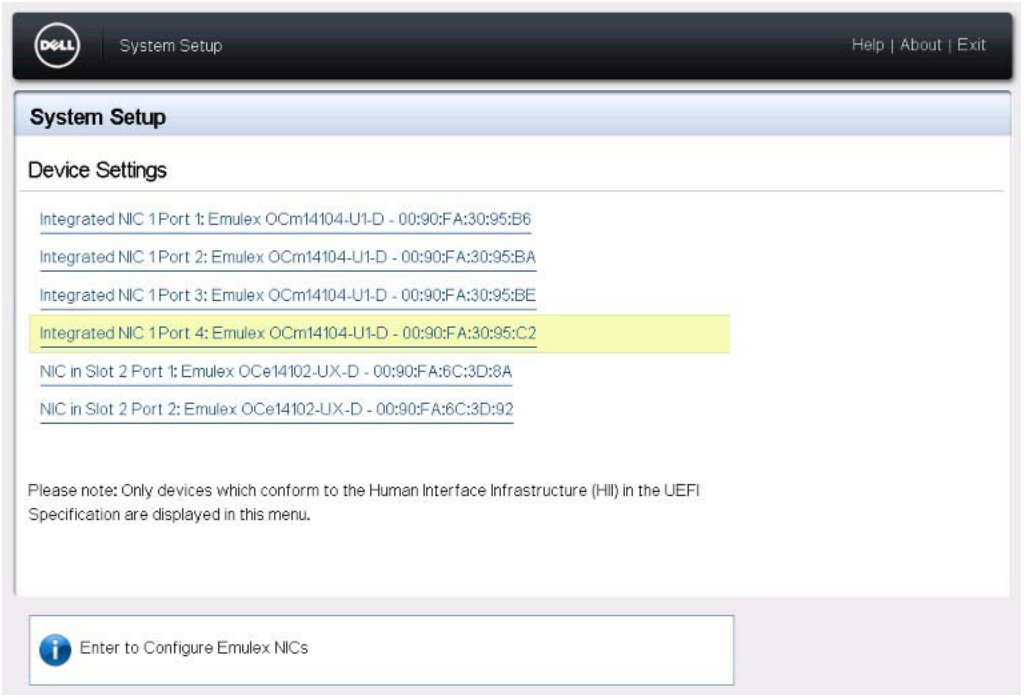
System Setup
Help | About | Exit
System Setup
Device Settings
Integrated NIC 1 Port 1: Emulex OCm14104-U1-D - 00:90:FA:30:95:B6
Integrated NIC 1 Port 2: Emulex OCm14104-U1-D - 00:90:FA:30:95:BA
Integrated NIC 1 Port 3: Emulex OCm14104-U1-D - 00:90:FA:30:95:BE
Integrated NIC 1 Port 4: Emulex OCm14104-U1-D - 00:90:FA:30:95:C2
NIC in Slot 2 Port 1: Emulex OCe14102-UX-D - 00:90:FA:6C:3D:8A
NIC in Slot 2 Port 2: Emulex OCe14102-UX-D - 00:90:FA:6C:3D:92
Please note: Only devices which conform to the Human Interface Infrastructure (HII) in the UEFI Specification are displayed in this menu.
Enter to Configure Emulex NICs

Figure F-1 Device Settings Page

The Main Configuration page for that adapter is displayed.

Main Configuration Page

This page displays device information and enables you to configure device parameters.

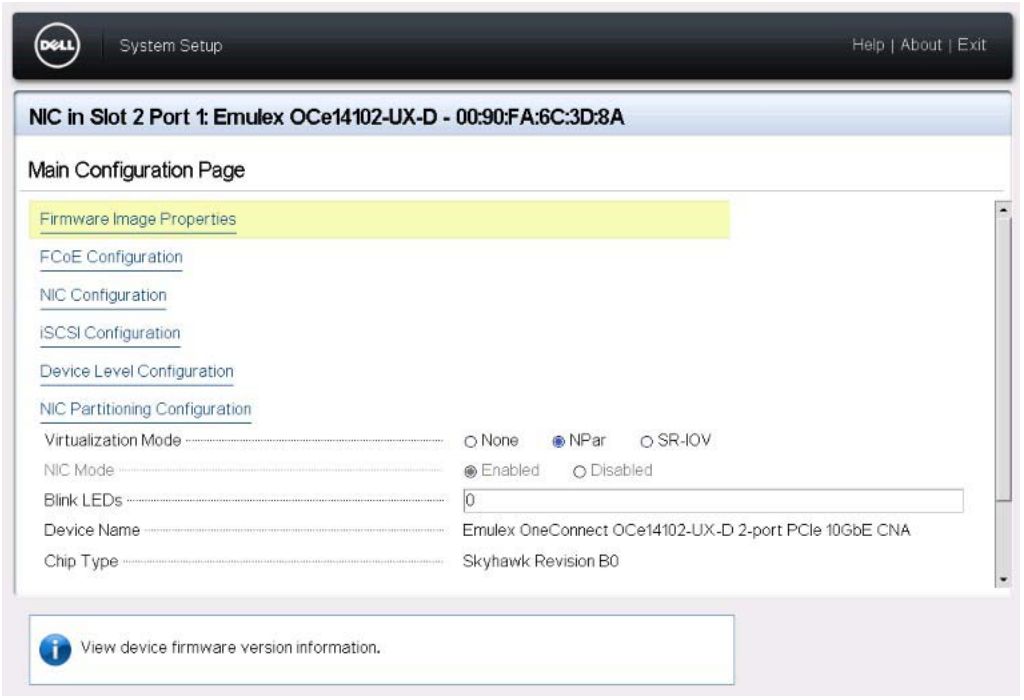

Figure F-2 Main Configuration Page

Table F-1 Main Configuration Page Menu Options

Menu Option	Description and Available Settings
Firmware Image Properties	View adapter firmware version information. See “Firmware Image Properties Page” on page 274 for more information.
FCoE Configuration	Configure FCoE boot parameters. See “FCoE Configuration Page” on page 275 for more information.
NIC Configuration	Configure boot protocol, Wake on LAN, link speed, and VLAN. See “NIC Configuration Page” on page 278 for more information.
iSCSI Configuration	Configure general, initiator, and target parameters for iSCSI boot. See “iSCSI Configuration Page” on page 280 for more information.
Device Level Configuration	View and configure global device level parameters. See “Device Level Configuration Page” on page 288 for more information.
NIC Partitioning Configuration	Configure functionality of NIC partitions and view assigned addresses. See “NIC Partitioning Configuration Page” on page 289 for more information.

Table F-1 Main Configuration Page Menu Options (Continued)

Menu Option	Description and Available Settings
Virtualization Mode	Specify the virtualization mode setting of the adapter. Available settings include: • None (default) • NPar • SR-IOV **Note:** Some menu options are not available when the Virtualization Mode is set to “None”.
NIC Mode	Always enabled.
Blink LEDs	Identify the physical port by blinking the port LED for up to 15 seconds. Available settings are 0–15 seconds (default).
Device Name	The name of the adapter.
Chip Type	The name and revision of the chip.
PCI Device ID	The PCI device ID of the port.
PCI Address	The PCI address assigned by the BIOS.
Link Status	The network link status reported by the adapter.

Firmware Image Properties Page

This page displays adapter firmware version information.

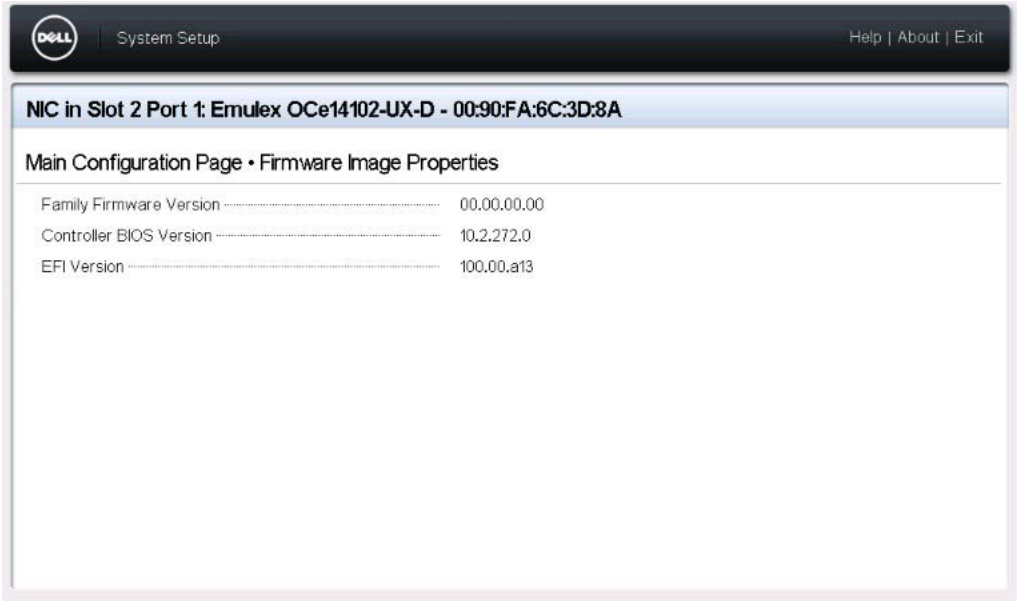

Figure F-3 Firmware Image Properties Page

Table F-2 Firmware Image Properties Page Menu Options

Menu Option	Description and Available Settings
Family Firmware Version	Firmware version information for the installed adapter.
Controller BIOS Version	BIOS version information for the installed adapter.
EFI Version	EFI driver version information for the installed adapter.

FCoE Configuration Page

This page allows you to configure FCoE boot parameters.

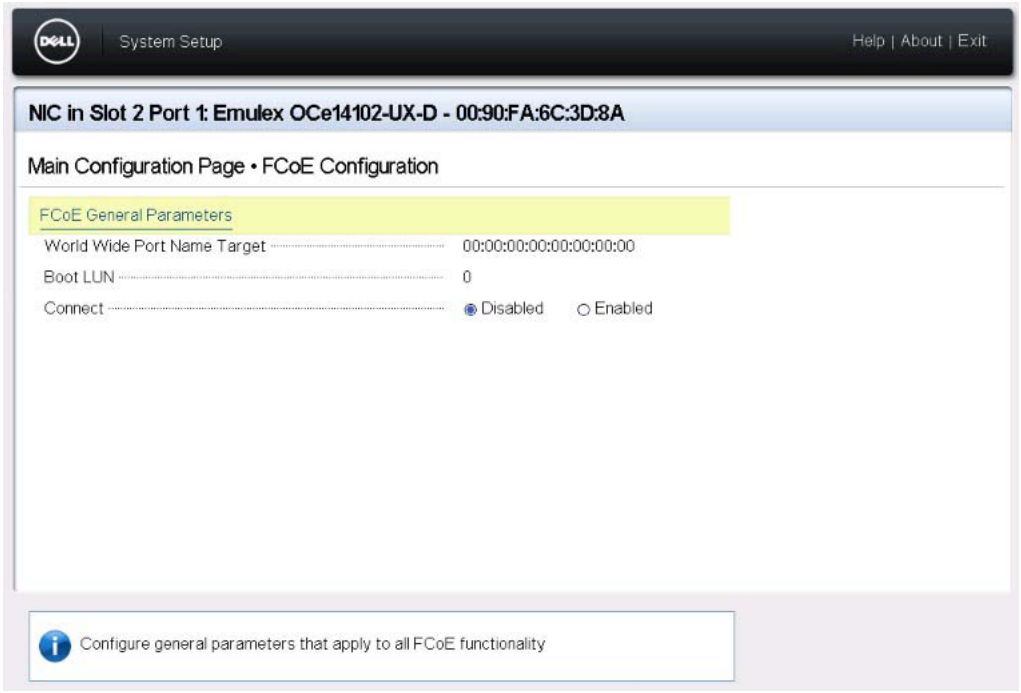

Figure F-4 FCoE Configuration Page

Table F-3 FCoE Configuration Page Menu Options

Menu Option	Description and Available Settings
FCoE General Parameters	Configure FCoE general parameters. See “FCoE General Parameters Page” on page 276 for more information.
World Wide Port Name Target	The first FCoE storage target’s WWPN.
Boot LUN	The first FCoE storage target’s LUN that will be used by the FCoE initiator as the system boot device.
Connect	Specify whether the FCoE initiator should connect to the first FCoE storage target defined. Available settings include: • Enabled • Disabled (default)

FCoE General Parameters Page

This page allows you to configure FCoE general parameters.

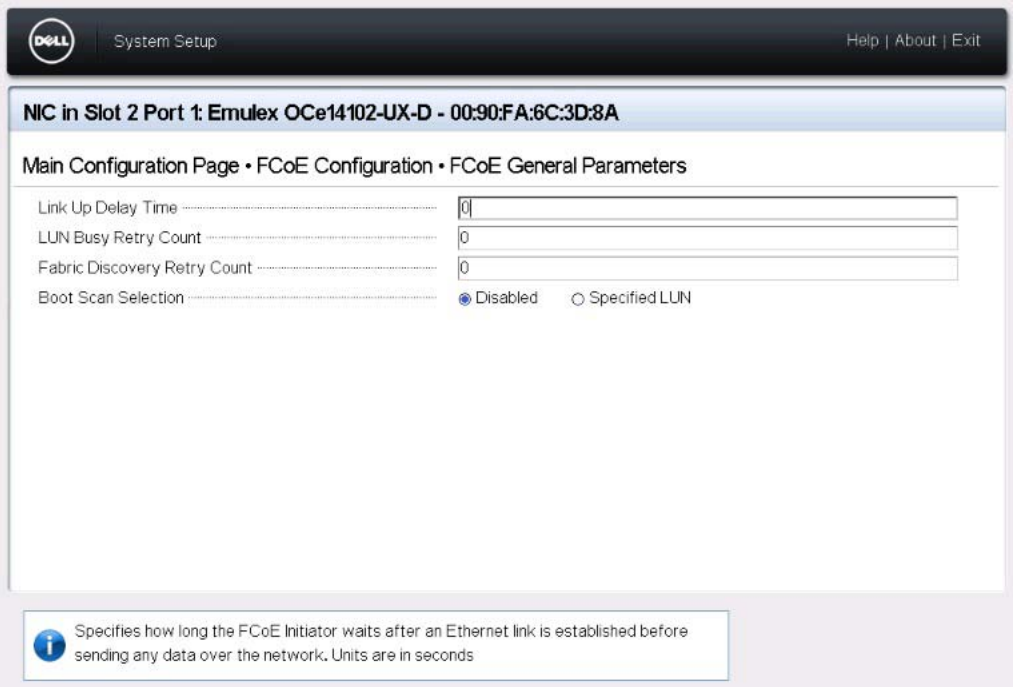
System Setup
Help | About | Exit
NIC in Slot 2 Port 1: Emulex OCe14102-UX-D - 00:90:FA:6C:3D:8A
Main Configuration Page • FCoE Configuration • FCoE General Parameters
Link Up Delay Time
0
LUN Busy Retry Count
0
Fabric Discovery Retry Count
0
Boot Scan Selection
Disabled
Specified LUN
Specifies how long the FCoE Initiator waits after an Ethernet link is established before sending any data over the network. Units are in seconds

Figure F-5 FCoE General Parameters Page

Table F-4 FCoE General Parameters Page Menu Options

Menu Option	Description and Available Settings
Link Up Delay Time	Specify how long (in seconds) the FCoE Initiator waits after an Ethernet link is established before sending any data over the network. The valid range is 0–255 seconds.
LUN Busy Retry Count	Specify the number of connection retries the FCoE boot initiator attempts if the FCoE target LUN is busy. The valid range is 0–60.
Fabric Discovery Retry Count	Specify the retry count for FCoE fabric discovery. The valid range is 0–60.

Table F-4 FCoE General Parameters Page Menu Options (Continued)

Menu Option	Description and Available Settings
Boot Scan Selection	Specify the adapter's initiator behavior for booting the system from specified FC boot targets or fabric discovered targets. Available settings include: • Disabled (default) – Initiator does not attempt to boot. • First LUN – Attempt boot from the first bootable LUN of the targets discovered by adapter. • First LUN 0 – Attempt boot from the first bootable LUN 0 of the targets discovered by adapter. • First LUN Not LUN 0 – Attempt boot from the first bootable LUN that is not LUN 0 of the targets discovered by adapter. • Fabric Discovered LUN – Attempt boot based on the LUN assignment provided by the fabric's management infrastructure. • Specified LUN – Initiator attempts to boot to the specified World Wide Port Name and LUN for the first target. If that fails, a boot using the second target parameters is attempted.

NIC Configuration Page

This page allows you to configure the boot protocol, Wake on LAN, link speed, and VLAN.

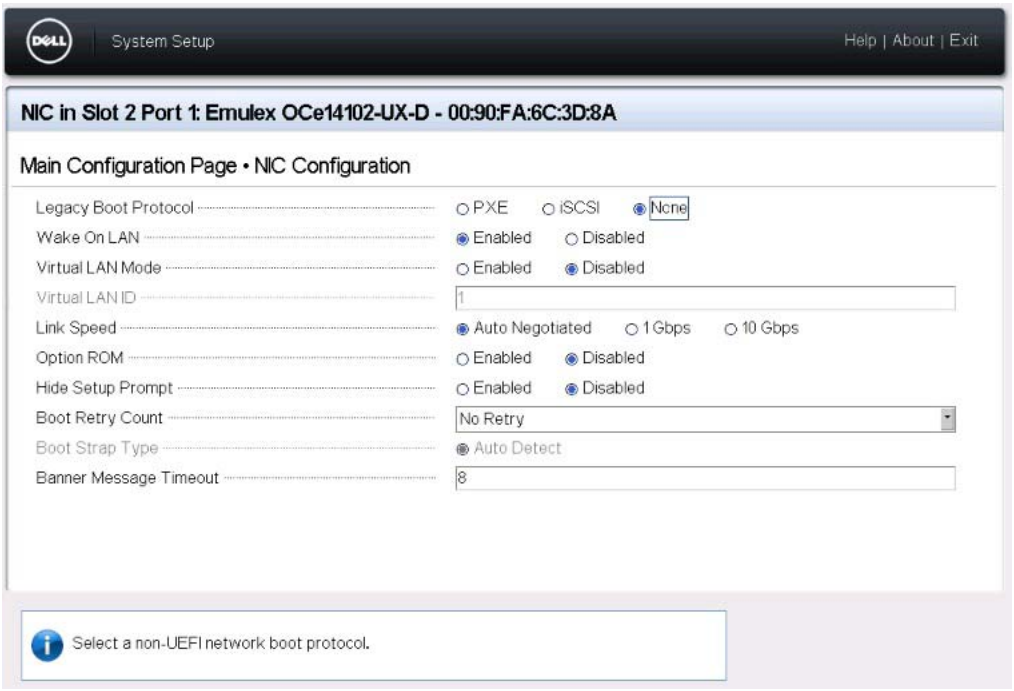

Figure F-6 NIC Configuration Page

Table F-5 NIC Configuration Page Menu Options

Menu Option	Description and Available Settings
Legacy Boot Protocol	Select a non-UEFI network boot protocol. Available settings include: • PXE • iSCSI • FCoE • None (default)
Wake On LAN	Enable or disable Wake On LAN. Available settings include: • Enabled (default) • Disabled
Virtual LAN Mode	Enable or disable virtual LAN mode. Available settings include: • Enabled • Disabled (default)
Virtual LAN ID	Specify the ID for VLAN Mode. The VLAN ID's valid range is 0–4095.

Table F-5 NIC Configuration Page Menu Options (Continued)

Menu Option	Description and Available Settings
Link Speed	Specify the port speed used for the selected protocol. Available settings include: • Auto Negotiated (default) • 1 Gbps • 10 Gbps
Option ROM	Enable or disable legacy boot protocols in the Option ROM. Available settings include: • Enabled • Disabled (default)
Hide Setup Prompt	Enable or disable the option ROM setup prompt (banner) during POST. Available settings include: • Enabled • Disabled (default)
Boot Retry Count	Control the number of retries in case of boot failure. Available settings include: • No Retry (default) • 1 Retry • 2 Retries • 3 Retries • 4 Retries • 5 Retries • 6 Retries • Indefinite Retries
Boot Strap Type	Control the boot strap method used to boot to the operating system. Available settings include: • Auto Detect (default)
Banner Message Timeout	Control the number of seconds that the Option ROM banner is displayed during POST. The valid range is 0–14. The default value is 8.

iSCSI Configuration Page

This page allows you to configure general, initiator, and target parameters for iSCSI boot.

System Setup
Help | About | Exit
NIC in Slot 2 Port 1: Emulex OCe14102-UX-D - 00:90:FA:6C:3D:8A
Main Configuration Page • iSCSI Configuration
iSCSI General Parameters
iSCSI Initiator Parameters
iSCSI First Target Parameters
iSCSI Second Target Parameters
iSCSI Secondary Device Parameters
Configure general iSCSI parameters.

Figure F-7 iSCSI Configuration Page

Table F-6 iSCSI Configuration Page Menu Options

Menu Option	Description and Available Settings
iSCSI General Parameters	Configure general iSCSI parameters. See "iSCSI General Parameters Page" on page 281 for more information.
iSCSI Initiator Parameters	Configures iSCSI initiator parameters. See "iSCSI Initiator Parameters Page" on page 283 for more information.
iSCSI First Target Parameters	Enable connection and configure parameters for the first iSCSI target. See "iSCSI First Target Parameters Page" on page 284 for more information.
iSCSI Second Target Parameters	Enable connection and configure parameters for the second iSCSI target. See "iSCSI Second Target Parameters Page" on page 286 for more information.
iSCSI Secondary Device Parameters	Configures the iSCSI secondary boot device parameters. See "iSCSI Secondary Device Parameters Page" on page 287 for more information.

iSCSI General Parameters Page

This page allows you to configure the general iSCSI parameters.

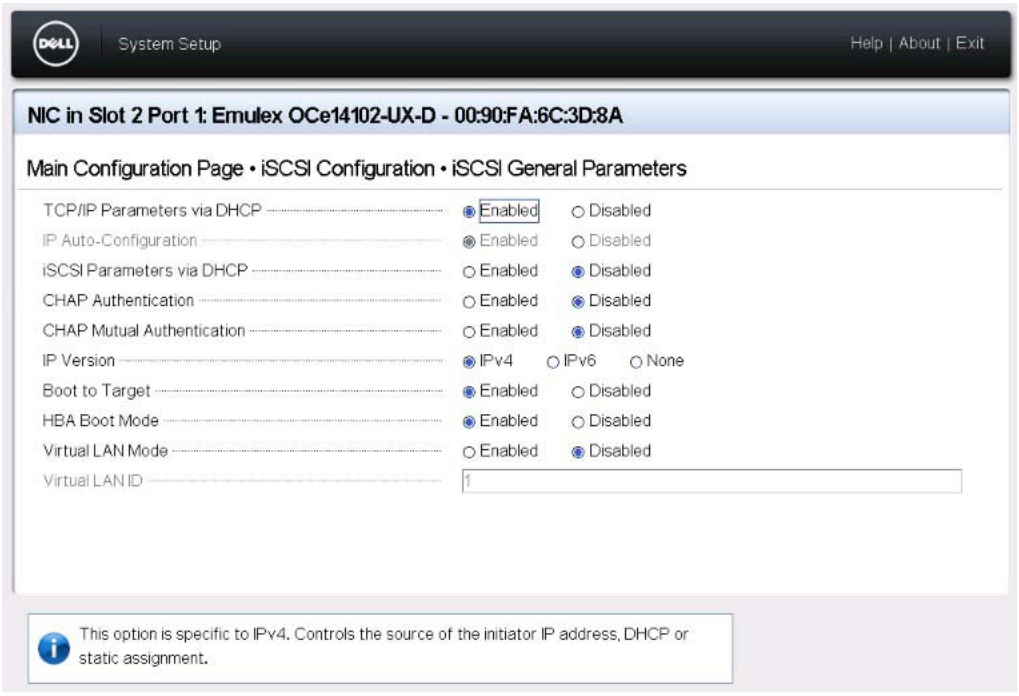

Figure F-8 iSCSI General Parameters Page

Table F-7 iSCSI General Parameters Page Menu Options

Menu Option	Description and Available Settings
TCP/IP Parameters via DHCP	Control the source of the initiator IP address: DHCP or static assignment. Available settings include: • Enabled • Disabled (default) **Note:** This option is specific to IPv4.
IP Auto-Configuration	Control the source of the initiator IP address: DHCP or static assignment. Available settings include: • Enabled • Disabled (default) **Note:** This option is specific to IPv6.
iSCSI Parameters via DHCP	Enable the acquisition of iSCSI target parameters from DHCP. Available settings include: • Enabled • Disabled (default)

Table F-7 iSCSI General Parameters Page Menu Options (Continued)

Menu Option	Description and Available Settings
CHAP Authentication	Enable the ability of the initiator to use CHAP authentication when connecting to the iSCSI target. Available settings include: • Enabled • Disabled (default)
CHAP Mutual Authentication	Setting to enable mutual CHAP authentication between the iSCSI initiator and target. To use mutual CHAP authentication, specify an initiator secret on the Initiator Parameters page and configure that secret on the target. Available settings include: • Enabled • Disabled (default)
IP Version	Control whether IPv4 or IPv6 network addressing is used for the iSCSI initiator. Available settings include: • IPv4 • IPv6 • None (default) – Dual mode
Boot to Target	Control whether the iSCSI initiator boots to the specified iSCSI target after connection. **Note:** This is only applicable to UEFI iSCSI boot. Available settings include: • Enabled • Disabled (default)
HBA Boot Mode	Control whether the iSCSI initiator will boot to the specified iSCSI target after connection. Available settings include: • Enabled (default) • Disabled
Virtual LAN Mode	Enable or disable iSCSI Virtual LAN mode, which allows a VLAN tag to be used by iSCSI boot. Available settings include: • Enabled • Disabled (default)
Virtual LAN ID	Specify the ID (tag) to be used for iSCSI VLAN Mode. The valid range for the VLAN ID is from 0 to 4095.

iSCSI Initiator Parameters Page

This page allows you to configure the iSCSI initiator parameters.

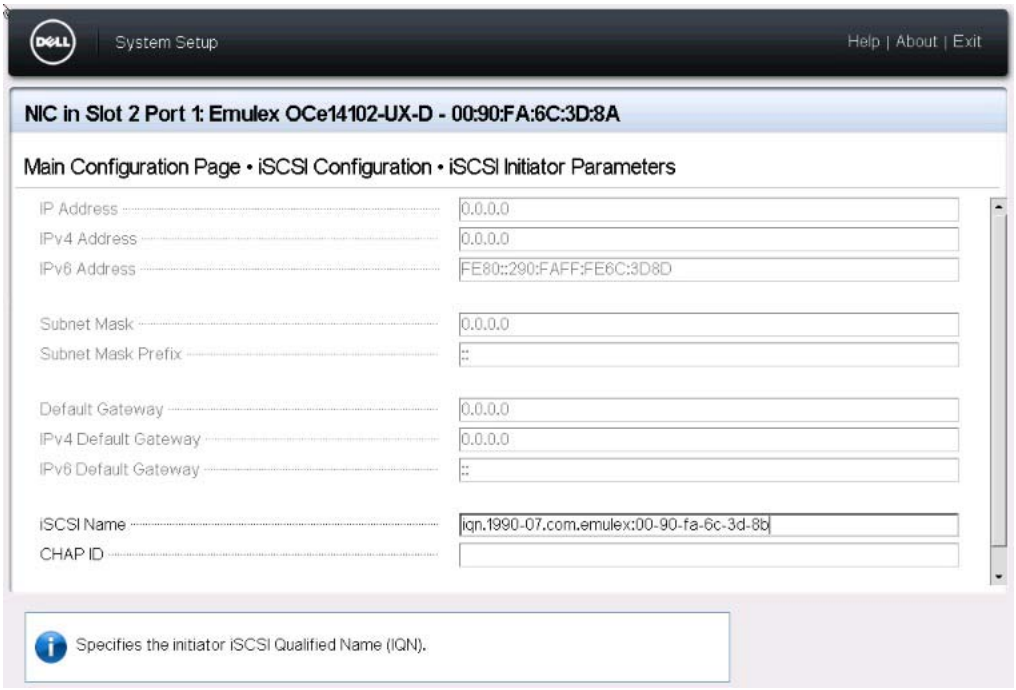

Figure F-9 iSCSI Initiator Parameters Page

Table F-8 iSCSI Initiator Parameters Page Menu Options

Menu Option	Description and Available Settings
IP Address	Specify the iSCSI initiator's IP address. The value should be in either IPv4 or IPv6 format and can be 2–39 characters long.
IPv4 Address	Specify the iSCSI initiator's IPv4 address. The value must be in IPv4 format and can be 7–15 characters long.
IPv6 Address	Specify the iSCSI initiator's IPv6 address. The value must be in IPv6 format and can be 2–39 characters long.
Subnet Mask	Specify the iSCSI initiator's IPv4 subnet mask. The value must be in IPv4 format and can be 7–15 characters long.
Subnet Mask Prefix	Specify the iSCSI initiator's IPv6 subnet mask. The value must be in IPv6 format and can be 2–39 characters long.
Default Gateway	Specify the iSCSI initiator's default gateway. The value should be in either IPv4 or IPv6 format and can be 2–39 characters long.
IPv4 Default Gateway	Specify the iSCSI initiator's IPv4 default gateway. The value must be in IPv4 format and can be 7–15 characters long.
IPv6 Default Gateway	Specify the iSCSI initiator's IPv6 default gateway The value must be in IPv6 format and can be 2–39 characters long.
iSCSI Name	Specify the initiator iSCSI Qualified Name (IQN). The valid range is 0–223 characters.

Table F-8 iSCSI Initiator Parameters Page Menu Options (Continued)

Menu Option	Description and Available Settings
CHAP ID	Specify the initiator CHAP ID. The valid range is 0–128 characters in length. If this can be set on a per target basis, then the first target value must be stored here.
CHAP Secret	Specify the ISCSI initiator's CHAP Secret. The valid range is 0 or 12–16 characters in length. If this can be set on a per target basis, the value for the first target must be stored here.

iSCSI First Target Parameters Page

This page allows you to enable a connection for the first iSCSI target and configure parameters.

Figure F-10 iSCSI First Target Parameters Page

Table F-9 iSCSI First Target Parameters Page Menu Options

Menu Option	Description and Available Settings
Connect	Enable connecting to the first iSCSI target. Available settings include: • Enabled • Disabled (default)
IP Address	Specify the first target's IP address. The value should be in either IPv4 or IPv6 format and can be 2–39 characters long.
TCP Port	Specify the first target's TCP port number. The valid range is 1–65535.

Table F-9 iSCSI First Target Parameters Page Menu Options (Continued)

Menu Option	Description and Available Settings
Boot LUN	Specify the first iSCSI storage target's boot LUN. The valid range is 0–18446744073709551615.
iSCSI Name	Specify the first iSCSI storage target's initiator IQN. The valid range is 0–223 characters.
CHAP ID	Specify the first ISCSI storage target's CHAP ID. The valid range is 0–128 characters in length. If only a single value of the CHAP ID is supported, then it is stored here.
CHAP Secret	Specify the first ISCSI storage target's CHAP Secret. The valid range is 0 or 12–16 characters in length. If only a single value of the CHAP Secret is supported, then it is stored here.
IP Version	Control whether IPv4 or IPv6 network addressing is used for the first iSCSI target. Available settings include: • IPv4 (default) • IPv6

iSCSI Second Target Parameters Page

This page allows you to enable a connection for the second iSCSI target and configure parameters.

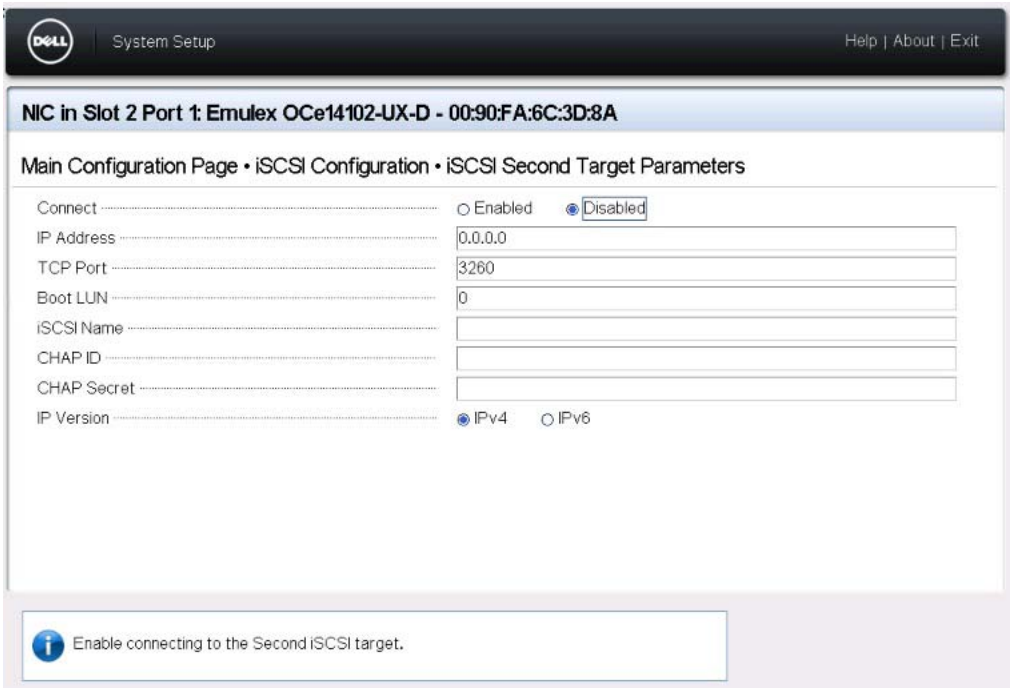

Figure F-11 iSCSI Second Target Parameters Page

Table F-10 iSCSI Second Target Parameters Page Menu Options

Menu Option	Description and Available Settings
Connect	Enable connecting to the second iSCSI target. Available settings include: • Enabled • Disabled (default)
IP Address	Specify the second target's IP address. The value should be in either IPv4 or IPv6 format and can be 2–39 characters long.
TCP Port	Specify the second target's TCP port number. The valid range is 1–65535.
Boot LUN	Specify the second iSCSI storage target's boot LUN. The valid range is 0–18446744073709551615.
iSCSI Name	Specify the second iSCSI storage target's initiator IQN. The valid range is 0–223 characters.
CHAP ID	Specify the second ISCSI storage target's CHAP ID. The valid range is 0–128 characters in length. If only a single value of the CHAP ID is supported for all targets, then it is stored here.
CHAP Secret	Specify the second ISCSI storage target's CHAP Secret. The valid range is 0 or 12–16 characters in length. If only a single value of the CHAP Secret is supported, then it is stored here.

Table F-10 iSCSI Second Target Parameters Page Menu Options (Continued)

Menu Option	Description and Available Settings
IP Version	Control whether IPv4 or IPv6 network addressing is used for the second iSCSI target. Available settings include: • IPv4 (default) • IPv6

iSCSI Secondary Device Parameters Page

This page allows you to configure the MAC address for a secondary iSCSI boot adapter.

System Setup
Help | About | Exit
NIC in Slot 2 Port 1: Emulex OCe14102-UX-D - 00:90:FA:6C:3D:8A
Main Configuration Page • iSCSI Configuration • iSCSI Secondary Device Parameters
Secondary Device MAC Address
00:00:00:00:00:00
Specifies the MAC address of a secondary iSCSI boot adapter for redundancy in case of boot failure.

Figure F-12 iSCSI Secondary Device Parameters Page

Table F-11 iSCSI Secondary Device Parameters Page Menu Options

Menu Option	Description and Available Settings
Secondary Device MAC Address	Configure the MAC address for a secondary iSCSI boot adapter in case of boot failure. The MAC address may have a maximum of 17 characters with a colon (:) separator between every two characters.

Device Level Configuration Page

This page displays the global device level parameters and allows you to configure them.

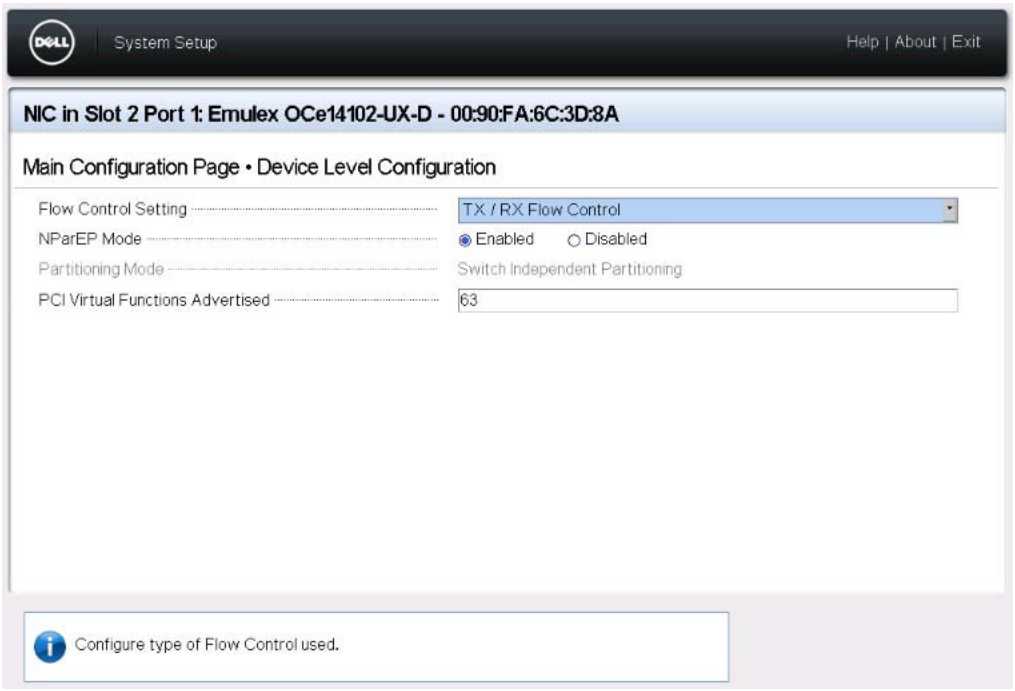

Figure F-13 Device Level Configuration Page

Table F-12 Device Level Configuration Page Menu Options

Menu Option	Description and Available Settings
Flow Control Setting	Configure the type of flow control used by the adapter. **Note:** Ethernet flow control cannot be changed when priority flow control is enabled on the switch ports and enabled in the firmware (through the OneCommand Manager application). Available settings include: • Auto • TX: Send Pause on RX Overflow • RX: Throttle TX on Pause Received • TX / RX Flow Control
NParEP Mode	Enable more than eight partitions on the device. It must not be enabled if the system and operating system do not support devices with more than eight PCI PFs. Available settings include: • Enabled • Disabled
Partitioning Mode	The current partitioning mode, which is always Switch Independent Partitioning.

Table F-12 Device Level Configuration Page Menu Options (Continued)

Menu Option	Description and Available Settings
PCI Virtual Functions Advertised	The number of PCI VFs to be advertised on this port in non-NPar mode. The valid range is 0–256. This value varies based on the adapter in use.

NIC Partitioning Configuration Page

This page displays NIC partition information and allows you to configure their functionality.

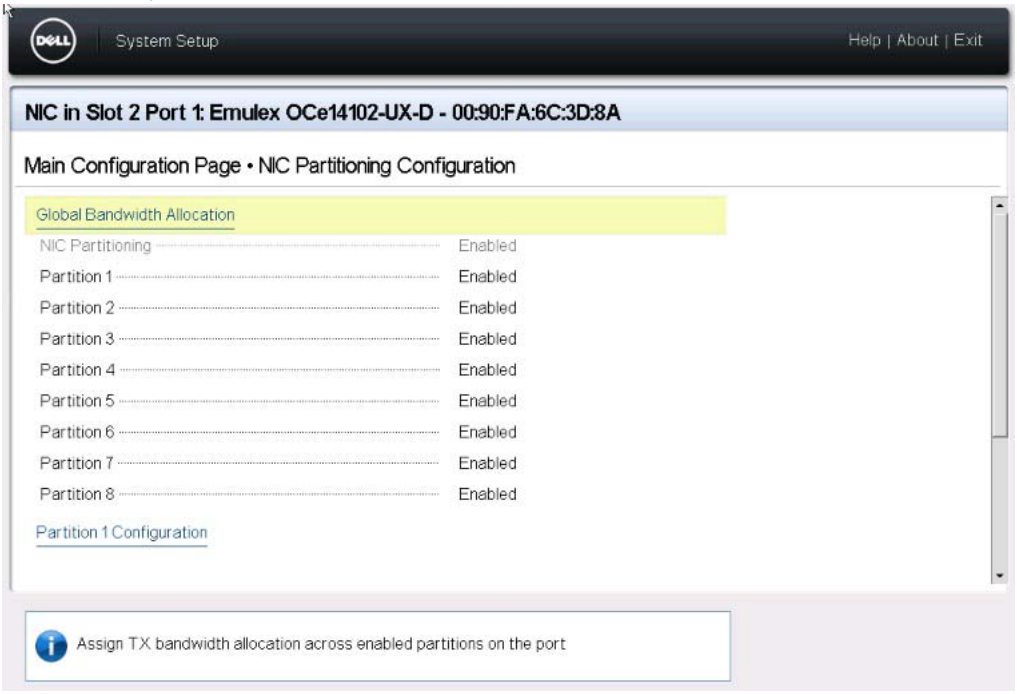
System Setup
Help | About | Exit
NIC in Slot 2 Port 1: Emulex OCe14102-UX-D - 00:90:FA:6C:3D:8A
Main Configuration Page • NIC Partitioning Configuration
Global Bandwidth Allocation
NIC Partitioning Enabled
Partition 1 Enabled
Partition 2 Enabled
Partition 3 Enabled
Partition 4 Enabled
Partition 5 Enabled
Partition 6 Enabled
Partition 7 Enabled
Partition 8 Enabled
Partition 1 Configuration
Assign TX bandwidth allocation across enabled partitions on the port

Figure F-14 NIC Partitioning Configuration Page

Table F-13 NIC Partitioning Configuration Page Menu Options

Menu Option	Description and Available Settings
Global Bandwidth Allocation	Assign TX bandwidth allocation across enabled partitions on the port. See “Global Bandwidth Allocation Page” on page 290 for more information.
NIC Partitioning	Indicate if NIC partitioning is enabled or disabled.
Partition n	View the current partition state. There is one listing for each partition with “n” representing the number of the partition.
Partition n Configuration	View the partition configuration. There is one listing for each partition with “n” representing the number of the partition. See “Partition Configuration Page” on page 291 for more information.

Global Bandwidth Allocation Page

This page allows you to configure the TX bandwidth allocation across enabled partitions on the port.

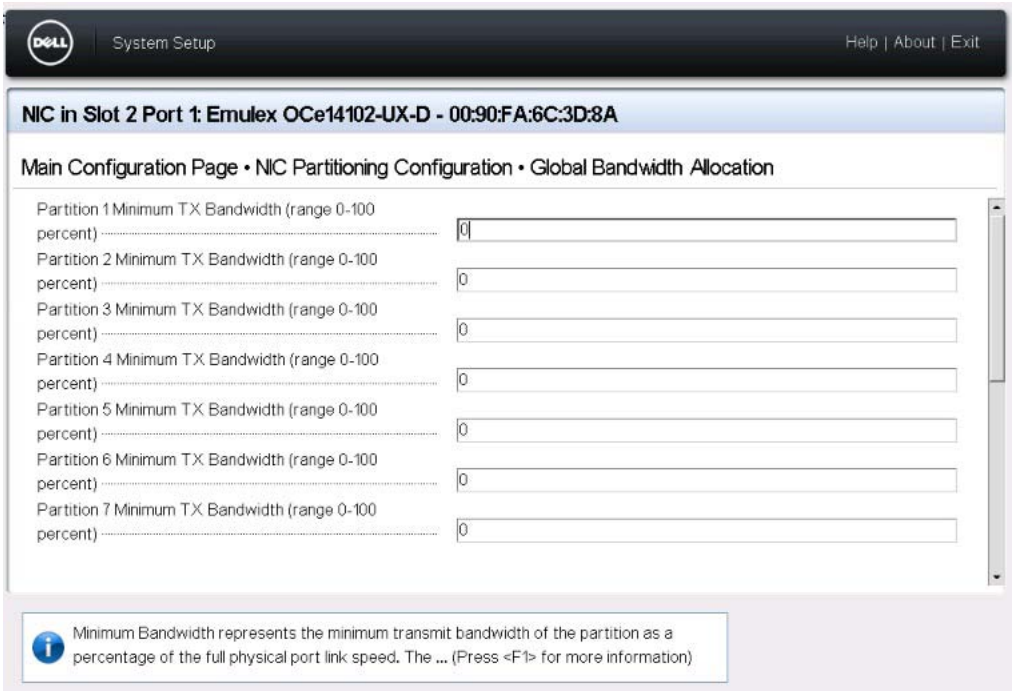
System Setup
Help | About | Exit
NIC in Slot 2 Port 1: Emulex OCe14102-UX-D - 00:90:FA:6C:3D:8A
Main Configuration Page • NIC Partitioning Configuration • Global Bandwidth Allocation
Partition 1 Minimum TX Bandwidth (range 0-100 percent)
Partition 2 Minimum TX Bandwidth (range 0-100 percent)
Partition 3 Minimum TX Bandwidth (range 0-100 percent)
Partition 4 Minimum TX Bandwidth (range 0-100 percent)
Partition 5 Minimum TX Bandwidth (range 0-100 percent)
Partition 6 Minimum TX Bandwidth (range 0-100 percent)
Partition 7 Minimum TX Bandwidth (range 0-100 percent)
0
Minimum Bandwidth represents the minimum transmit bandwidth of the partition as a percentage of the full physical port link speed. The ... (Press <F1> for more information)

Figure F-15 Global Bandwidth Allocation Page

Table F-14 Global Bandwidth Allocation Page Menu Options

Menu Option	Description and Available Settings
Partition n Minimum TX Bandwidth	The minimum transmit bandwidth value is the least amount of bandwidth that the partition can provide. It is represented as a percentage. There is one listing for each partition with "n" representing the number of the partition. The valid range is 0-100 percent for each enabled partition. The minimum transmit bandwidth value must be less than or equal to the maximum transmit bandwidth value. The total of the minimum transmit bandwidth values for all enabled functions on that port must be equal to 100. **Note:** A minimum transmit bandwidth value of 0 is a valid value. When all of the partitions' minimum transmit bandwidth values are zero, the bandwidth is distributed equally among the current active partitions.
Partition n Maximum TX Bandwidth	The maximum transmit bandwidth value is the greatest amount of bandwidth that the function can provide. It is represented as a percentage. There is one listing for each partition with "n" representing the number of the partition. The valid range is 0-100 percent for each enabled partition.

Partition Configuration Page

This page displays information for a particular partition and allows you to configure some partition parameters. There is a separate page for each available partition.

Note: There can be only one storage function on each port. Once a storage function is enabled on a partition, the storage protocols appear as unavailable on the other partitions.

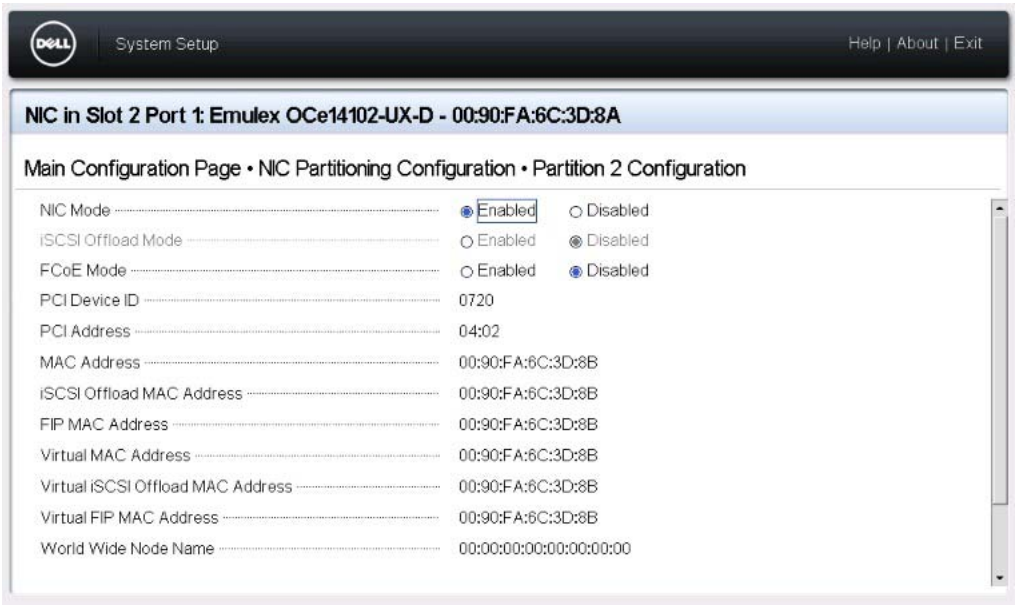

Figure F-16 Partition Configuration Page

Table F-15 Partition Configuration Page Menu Options

Menu Option	Description and Available Settings
NIC Mode	Enable or disable the NIC personality on the partition. Available settings include: • Enabled • Disabled The default setting is "Enabled" on all partitions. **Note:** The NIC Mode setting cannot be changed on Partition 1 of each port.
iSCSI Offload Mode	Enable or disable the iSCSI offload personality on the partition. Available settings include: • Enabled • Disabled (default)
FCoE Mode	Enable or disable the FCoE personality on the partition. Available settings include: • Enabled • Disabled (default)
PCI Device ID	The PCI device ID for the partition.

Table F-15 Partition Configuration Page Menu Options (Continued)

Menu Option	Description and Available Settings
PCI Address	The PCI address for the partition. This value is assigned by the system BIOS.
MAC Address	The permanent MAC address assigned at the factory.
iSCSI Offload MAC Address	The permanent MAC address for iSCSI offload assigned at the factory.
FIP MAC Address	The permanent FIP-MAC address for FCoE assigned at the factory.
Virtual MAC Address	A programmatically assignable MAC address for the partition.
Virtual iSCSI Offload MAC Address	Configure the MAC address for iSCSI offload. The setting may have a maximum of 17 characters with a colon (:) separator between every two characters.
Virtual FIP MAC Address	A programmatically assignable FIP-MAC address for the partition FCoE.
World Wide Node Name	The FC World Wide Node Name ID for FCoE. A maximum of 23 characters is supported. A colon separator (:) must be used between every two characters.
Virtual World Wide Node Name	Specify the FC World Wide Node Name ID for FCoE. A maximum of 23 characters is supported. A colon separator (:) must be used between every two characters.
World Wide Port Name	The FC World Wide Port Name ID for FCoE. A maximum of 23 characters is supported. A colon separator (:) must be used between every two characters.
Virtual World Wide Port Name	Specify the FC World Wide Port Name ID for FCoE. A maximum of 23 characters is supported. A colon separator (:) must be used between every two characters.

Appendix G. Configuring PXE Boot for NIC on Dell OCe10100-based Systems

This section describes how to use the PXESelect utility to set up a PXE bootable network by configuring your Dell OCe10100-based controllers.

Note: For Dell OCe14000-based adapters, see appendix H., "Configuring PXE Boot for NIC on Dell OCe14000-based Systems," on page 300.

For more information on the PXE protocol, the PXE Boot process, and remotely installing with PXE on different operating systems, see chapter 2., "Configuring PXE Boot for NIC on LPe16202, OCe10100, and OCe11100-series Adapters," on page 25.

Running the PXESelect Utility

To run the PXESelect utility, start or restart your computer. When prompted, hold down **<Ctrl>** and press **<P>**. If you are running the PXESelect utility with multiple controllers, all your controllers are displayed when you start the utility. For example:

```
Press <Ctrl><P> for PXESelect(TM)Utility

Controller#0 Port#0 Base 0xFCE60000 at Bus:05 Dev:00 Fun:00
Controller#0 Port#1 Base 0xFCEA0000 at Bus:05 Dev:00 Fun:01
Controller#1 Port#0 Base 0xFC920000 at Bus:01 Dev:00 Fun:00
Controller#1 Port#1 Base 0xFC960000 at Bus:01 Dev:00 Fun:01
- Initializing ...Done.
```

The PXE Configuration menu appears after the boot BIOS initializes to begin your PXE configuration.

Note: A UEFI-capable system typically does not display the prompt for running the PXESelect utility unless it is configured for legacy booting. See your system configuration manual for information on performing a legacy boot. All configuration that can be performed in the PXESelect utility can instead be performed in the UEFI configuration utility. See appendix F., "Dell UEFI," on page 271 for more information.

Navigating the PXESelect Utility

Use the following methods to navigate the PXESelect utility:

- Press the up/down arrows on your keyboard to move through and select menu options or configuration fields. When multiple adapters are listed, use the up/down arrows to scroll to the additional adapters.
- Press **<Tab>** to move to the next field or to select a row in a configuration screen. Use **<Shift> <Tab>** to move to the previous field.
- Press **<Enter>** to accept a selection, select a menu option, or to change a configuration default.

- Press **<Esc>** to return to the previous menu or page, cancel a selection or dialog box, or exit the utility.

Setting Up a PXE Bootable Network

After the PXE boot BIOS initializes, you can use the PXESelect utility to set up a PXE bootable network by configuring your controllers.

To configure controllers for PXE boot:

1. At the Controller Selection Menu, use the **<Tab>** key to select the controller you want to configure and press **<Enter>**.

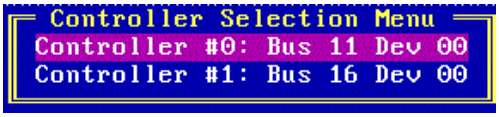

Figure G-1 Controller Selection Menu

Note: The Controller Selection Menu only appears if there are two or more adapters connected.

The Port Selection Menu appears.

2. Select the port you want to configure and press **<Enter>**.

Figure G-2 Port Selection Menu

Note: The Port Selection Menu only appears if there are two or more ports connected.

The Port Configuration screen appears after you select a port in the Port Selection Menu.

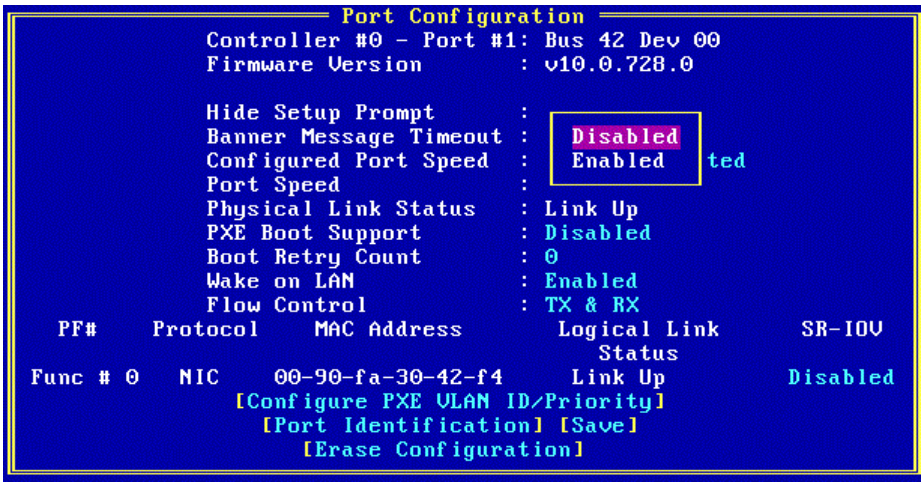
Port Configuration
Controller #0 - Port #1: Bus 42 Dev 00
Firmware Version : v10.0.728.0
Hide Setup Prompt :
Banner Message Timeout :
Configured Port Speed :
Port Speed :
Physical Link Status : Link Up
PXE Boot Support : Disabled
Boot Retry Count : 0
Wake on LAN : Enabled
Flow Control : TX & RX
Disabled
Enabled
ted
PF# Protocol MAC Address Logical Link Status SR-IOV
Func # 0 NIC 00-90-fa-30-42-f4 Link Up Disabled
[Configure PXE VLAN ID/Priority]
[Port Identification] [Save]
[Erase Configuration]

Figure G-3 Port Configuration Screen

The Port Configuration screen enables you to perform the following tasks:

- Configure the Hide Setup prompt
- Configure the banner message timeout
- Set the configured port speed
- Configure PXE boot support
- Configure the boot retry count
- Configure Wake on LAN (WoL)
- Configure flow control
- Configure SR-IOV
- Configure PXE VLAN ID and Priority
- Identify ports
- Erase the port and adapter configuration

Configuring the Hide Setup Prompt

This setting enables or disables the CTRL<P> setup prompt (banner) during POST.

To configure the Hide Setup prompt:

1. On the configuration screen, use the **<Tab>** key to select the Hide Setup Prompt setting and a pop-up menu appears.
2. Select **Enabled** or **Disabled** and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

Configuring the Banner Message Timeout

This setting controls the number of seconds that the PXE banner message is displayed during POST. The valid range is 0–14.

To configure the banner message timeout:

1. On the configuration screen, use the **<Tab>** key to select the Banner Message Timeout setting and a prompt appears.
2. Enter the desired amount of time (in seconds) and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

Setting the Configured Port Speed

To set the port speed:

1. On the configuration screen, use the **<Tab>** key to select the Configured Port Speed setting and a pop-up menu appears.
2. Select **Auto Negotiated**, **10G**, or **1G** and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

Configuring PXE Boot Support

To configure PXE boot support:

1. On the configuration screen, use the **<Tab>** key to select the PXE Boot Support setting and a pop-up menu appears.
2. Select **Enabled** or **Disabled** and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

Note: During system startup, PXE contacts the DHCP server for an IP address to boot from the network.

Configuring the Boot Retry Count

This setting specifies the number of boot retry attempts before control is returned to the system BIOS. Valid values include:

- 0 (no retry)
- 1–7

To configure the boot retry count:

1. On the configuration screen, use the **<Tab>** key to select the Boot Retry Count setting and a prompt appears.
2. Enter the desired number of retries and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

Configuring Wake on LAN

To configure Wake on LAN:

1. From the configuration screen, use the **<Tab>** key to select the current Wake on LAN setting and a pop-up menu appears.
2. Select **Enabled** or **Disabled** and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

Configuring Flow Control

This setting allows you to configure the type of flow control used by the adapter.

To configure flow control:

1. From the configuration screen, use the **<Tab>** key to select the current Flow Control setting and a pop-up menu appears.
2. Select one of the following settings and press **<Enter>**.
   - TX & RX
   - TX (Send Pause on RX Overflow)
   - RX (Throttle TX on Pause Received)
   - Disabled
3. Select **Save** and press **<Enter>**.

Configuring SR-IOV

If your system BIOS supports SR-IOV, you can enable it. For more information on SR-IOV configuration, see the appropriate Emulex driver manual.

1. On the configuration screen, use the **<Tab>** key to select the SR-IOV setting and a pop-up menu appears.
2. Select **Enabled** or **Disabled** and press **<Enter>**.
3. Select **Save** and press **<Enter>**.

Configuring the PXE VLAN ID and Priority

To configure a PXE VLAN ID and set the priority level:

1. On the configuration screen, select **Configure PXE VLAN ID/Priority** and press **<Enter>**. The Configure PXE VLAN ID/Priority menu is displayed.

Figure G-4 Configure PXE VLAN ID/Priority Menu

2. Use the **<Tab>** key to select the PXE VLAN Support setting and a pop-up menu appears.
   a. For PXE VLAN Support, select **Enabled** and press **<Enter>**.
   b. For the PXE VLAN ID, enter a number from 0-4094 and press **<Enter>**.
   c. For the PXE VLAN Priority level, enter a number from 0-7 and press **<Enter>**. This unique value assigns a priority to outbound packets containing a specified VLAN ID. Valid values range from 0-7, with 0 the highest priority level.
3. Select **Save** and press **<Enter>**.

After you exit the PXESelect utility, the system will reboot for the configuration to take effect.

Physically Identifying the Port

To physically determine which port you are configuring by causing the link and activity LEDs of that port to blink:

1. On the configuration screen, select **Port Identification** and press **<Enter>**. The Port Identification screen appears.

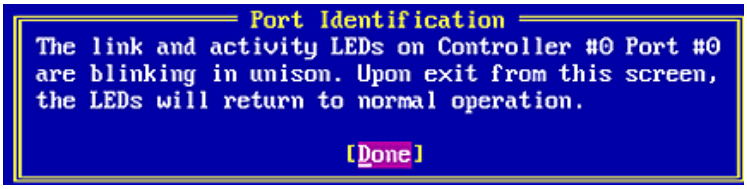
Port Identification
The link and activity LEDs on Controller #0 Port #0
are blinking in unison. Upon exit from this screen,
the LEDs will return to normal operation.
[Done]

Figure G-5 Port Identification Screen

2. The LEDs on your controller begin blinking. The selected port's LED status indicators blink on your controller until you select **Done** on this screen and press **<Enter>**.

Note: Not all controllers have LEDs that are visible externally. If you are using an add-in card in a blade server environment, the port identification or beaconing capability does not work.

Erasing Ports and Controller Configuration

Note: When selecting this setting, all previous configuration settings are returned to their factory default settings including the current protocol selection. Emulex recommends performing this action to provide a clean environment for new configuration settings to take effect.

To erase the ports and controller configuration:

1. On the configuration screen, select **Erase Configuration** and press **<Enter>**. A warning appears asking if you want to erase the current configuration for all ports of the controller.
2. Press **<Y>** to delete the configuration. You will receive another warning asking you to confirm the permanent removal of the controller configuration.
3. Press **<Y>** to delete the configuration.

To exit the PXESelect utility after erasing the ports and controller configuration:

1. Follow the instructions on the bottom of the individual menu screens until you are prompted to exit.
2. Press **<Y>** to exit. Depending on what settings were changed, a reboot may be necessary.

   Note: For older systems, depending on the memory allocation method supported, the PXESelect utility automatically reboots even when there are no changes made to the system.

PXE Boot Parameters Default Values

The default settings for the PXE Boot parameters are listed in the following table.

Table G-1 PXE Boot Parameter Default Values

Parameter	Default Value	Valid Values
Hide Setup Prompt	Disabled	Enabled Disabled
Banner Message Timeout	8	0–14
Port Speed	Auto Negotiated	Auto Negotiated 10G 1G
PXE Boot Support	Disabled	Enabled Disabled
Boot Retry Count	0	0 (no retry) 1–7 Retries
Wake on LAN	Enabled	Enabled Disabled
Flow Control	TX & RX	TX & RX TX RX Disabled
SR-IOV	Disabled	Enabled Disabled
VLAN Support	Disabled	Enabled Disabled
VLAN ID	0	1–4094
VLAN Priority	0	0–7

Appendix H. Configuring PXE Boot for NIC on Dell OCe14000-based Systems

This section describes how to use the PXESelect utility to set up a PXE bootable network by configuring your Dell OCe14000-based controllers.

Note: For Dell adapter models D6T93, F6PCP, JJPC0, and P3V42, PXE boot can be performed only on the first NIC partition on each port in the legacy x86 BIOS.

Note: For Dell OCe10100-based adapters, see appendix G., "Configuring PXE Boot for NIC on Dell OCe10100-based Systems," on page 293.

For more information on the PXE protocol, the PXE Boot process, and remotely installing with PXE on different operating systems, see chapter 3., "Configuring PXE Boot for NIC on OCe14000-series Adapters," on page 43.

Running the PXESelect Utility

To run the PXESelect utility, start or restart your computer. When prompted, hold down **<Ctrl>** and press **<P>**. If you are running the PXESelect utility with multiple controllers, all your controllers are displayed when you start the utility. For example:

```
Press <Ctrl><P> for PXESelect(TM)Utility

Controller#0 Port#0 Base 0xFCE60000 at Bus:05 Dev:00 Fun:00
Controller#0 Port#1 Base 0xFCEA0000 at Bus:05 Dev:00 Fun:01
Controller#1 Port#0 Base 0xFC920000 at Bus:01 Dev:00 Fun:00
Controller#1 Port#1 Base 0xFC960000 at Bus:01 Dev:00 Fun:01
- Initializing ...Done.
```

The PXE Configuration menu appears after the boot BIOS initializes to begin your PXE configuration.

Note: A UEFI-capable system typically does not display the prompt for running the PXESelect utility unless it is configured for legacy booting. See your system configuration manual for information on performing a legacy boot. All configuration that can be performed in the PXESelect utility can instead be performed in the UEFI configuration utility. See appendix F., "Dell UEFI," on page 271 for more information.

Navigating the PXESelect Utility

Use the following methods to navigate the PXESelect utility:

- Press the up or down arrows on your keyboard to move through and select menu options or configuration fields. When multiple adapters are listed, use the up/down arrows to scroll to the additional adapters.

- Press the left or right arrows on your keyboard to move through and select setting options.
- Press **<Enter>** to accept a selection, select a menu option, or to change a configuration default.
- Press **<F7>** to save the changes on the screen.
- Press **<Esc>** to return to the previous menu or page, cancel a selection or dialog box, or exit the utility.

Setting Up a PXE Bootable Network

After the PXE boot BIOS initializes, you can use the PXESelect utility to set up a PXE bootable network by configuring your controllers.

To configure controllers for PXE boot:

1. From the Controller List screen, use the up or down arrow keys to select the controller you want to configure and press **<Enter>**.

Figure H-1 Controller List Screen

Note: The Controller List screen only appears if there are two or more adapters connected.

The Controller Configuration screen appears.

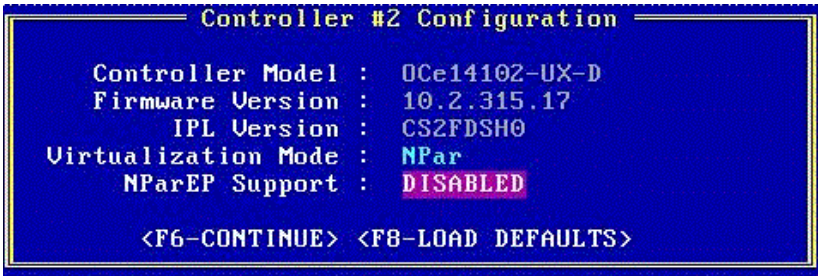

Figure H-2 Controller Configuration Screen

Depending on the adapter, one or more of the following items are displayed:

- Controller Name – displays the controller's name.
- Firmware Version – displays the current firmware version.
- IPL Version – displays the IPL version.
- Virtualization Mode – select from one of the following options:
  - NPar – when NIC partitioning (NPar) is selected, you can access up to eight virtual network interfaces (all partitions are set to NIC by default).

- For additional information on NPar support, see "Configuring NPar" on page 303.

- SRIOV – if your system BIOS supports SR-IOV, you can select this virtualization mode. SR-IOV support can only be enabled when NPar support is disabled. For more information on SR-IOV configuration, see the appropriate Emulex driver manual.
- None – when there is no virtualization mode selected, there is only one NIC function on each port and there are no storage functions.

Note: A reboot will occur when you exit the PXESelect utility if the virtualization mode has changed since the last boot.

- NParEP Support – when this option is enabled, each port may be partitioned into isolated PFs (channels) up to total of 16 functions. See "Enabling NParEP Support" on page 305 for more information.

Note: NParEP support is available only on Dell 13G or newer systems.

2. Once you have set the options in the Controller Configuration screen, press **<F7>** to save the current settings.
3. Press **<F6>** to proceed.

Note: If you want to erase the current configuration, press **<F8>**. See "Erasing Ports and Controller Configuration" on page 310 for more information.

The Port Selection Menu appears.

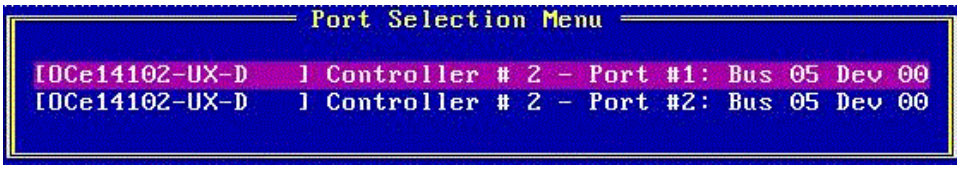

Figure H-3 Port Selection Menu

Note: The Port Selection Menu only appears if there are two or more ports connected.

4. Select the port you want to configure and press **<Enter>**. The Port Menu appears.
5. From the Port Menu, you can select one of the following options:
   - NPar Configuration – see "Configuring NPar" on page 303 for additional information.
   - Boot Configuration – see "Configuring Boot Options" on page 306 for additional information.
   - Port Configuration – see "Configuring Port Options" on page 308 for additional information.

Select the desired configuration option and press **<Enter>**.

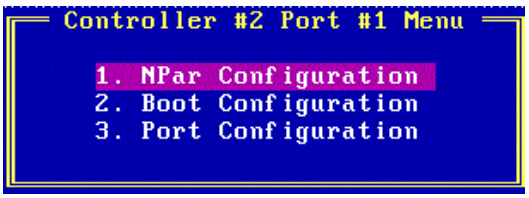

Figure H-4 Port Menu

Configuring NPar

NPar support provides the ability to configure multiple physical functions or I/O partitions for each physical adapter port.

Notes:

- The settings in this menu can only be configured when the virtualization mode is set to "NPar". Otherwise, the settings in this menu are for display purposes only.
- When NPar support is enabled, you must configure the NPar settings (minimum and maximum bandwidths) for iSCSI and FCoE storage functions in the NIC BIOS before they can be configured further from their respective utilities (iSCSI or FCoE BIOS). Otherwise, the Logical Link for that function will still show as down, and you will not be able to log into targets or find LUNs behind those targets.

To configure NPar:

1. From Port Menu (Figure H-4), select **1. NPar Configuration** and press **<Enter>**. The Partition List screen appears.

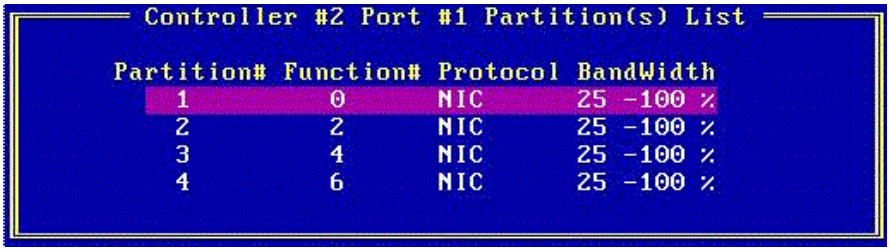
Controller #2 Port #1 Partition(s) List
Partition# Function# Protocol BandWidth
1 0 NIC 25 -100 %
2 2 NIC 25 -100 %
3 4 NIC 25 -100 %
4 6 NIC 25 -100 %

Figure H-5 Partition(s) List Screen

2. Select the partition you want to configure and press **<Enter>**. The Configure Partition screen appears.

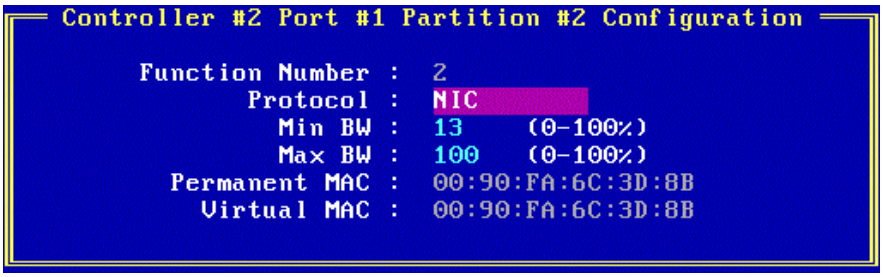
Controller #2 Port #1 Partition #2 Configuration
Function Number : 2
Protocol : NIC
Min BW : 13 (0-100%)
Max BW : 100 (0-100%)
Permanent MAC : 00:90:FA:6C:3D:8B
Virtual MAC : 00:90:FA:6C:3D:8B

Figure H-6 Configure Partition Screen

3. From the Configure Partition screen, you can perform the following tasks:
   - View the function number.
   - Select the protocol for each function, except for PF #0 and PF #1.
   - Configure the minimum and maximum bandwidth for each channel
   - View the permanent and virtual MAC addresses.

Selecting the Protocol

This option specifies a list of available protocols that can be configured on the adapter. Depending on the protocols for which the adapter is licensed, one of the following selections appears:

- NIC
- iSCSI
- FCoE

  Note: The iSCSI and FCoE personalities are enabled on one function per adapter port and include NIC functionality on the other enabled functions. There can be only one storage protocol on each port.

- None – the "None" selection allows you to disable that particular function (0–7).

The menu only displays the available personalities, including both free and licensed personalities.

To select the protocol:

1. From the Configure Partition screen, use the left or right arrow keys to select the desired protocol.
   - NIC
   - iSCSI
   - FCoE
   - None
2. Press **<F7>** to save.

Note: Changing the protocol setting requires a reboot before the change will take effect. A reboot will occur when you exit the PXESelect utility if the protocol selection has changed since the last boot.

Configuring Minimum and Maximum Bandwidth

To configure bandwidth:

1. On the Configure Partition screen, use the left or right arrow keys to select the minimum bandwidth (**Min BW**) and maximum bandwidth (**Max BW**) settings.
   - The Min BW value is the least amount of bandwidth that the function can provide. It is represented as a percentage. The Min BW value must be less than or equal to the Max BW value. The total of the Min BW values for all enabled functions on that port must be equal to 100.

     Note: A Min BW value of 0 is a valid value. When all of the partitions' Min BW values are zero, the bandwidth is distributed equally among the current active partitions.

   - The Max BW value is the greatest amount of bandwidth that the function can provide. It is represented as a percentage.
2. Press **<F7>** to save.

Enabling NParEP Support

Note: NParEP support is available only on Dell 13G or newer systems.

NParEP support provides the ability to configure additional PCI functions or I/O partitions for each physical adapter port.

You can configure up to 16 functions on a one-port OCe14400-series adapter, up to eight functions per port on a one or two-port OCe14100-series adapter, and up to four functions per port on a four-port OCe14100-series adapter.

The maximum number of functions allowed on an adapter is controlled by the adapter's IPL file and the system's support for NParEP.

The following requirements must be met in order to support more than eight functions on an adapter.

- The Dell system hardware (the motherboard and BIOS) must support NParEP.
- The host operating system must support NParEP:
  - Windows Server 2012 and newer versions
  - RHEL 6.4 and newer versions
  - SLES 11 SP2 and newer versions
  - ESXi 5.0 and newer versions
- The application management tools, including the OneCommand Manager application, must support NParEP.
- NParEP must be enabled in the firmware using the OneCommand Manager application.

If these conditions are not met, you may be able to configure more than eight functions, but only up to eight functions will be running and discovered after a reboot.

To enable NParEP:

1. From Controller Configuration screen (Figure H-2), highlight the NParEP Support menu item.
2. Select **Enabled** and press **<F7>** to save.

When NParEp is enabled, additional functions are displayed on the Partition List screen.

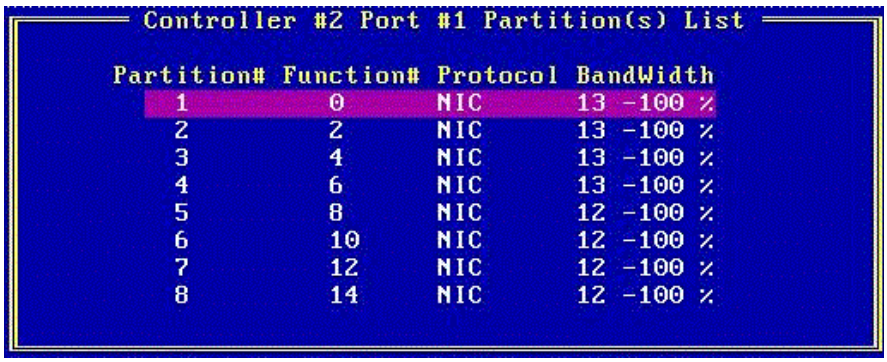
Controller #2 Port #1 Partition(s) List
Partition# Function# Protocol BandWidth
1 0 NIC 13 -100 %
2 2 NIC 13 -100 %
3 4 NIC 13 -100 %
4 6 NIC 13 -100 %
5 8 NIC 12 -100 %
6 10 NIC 12 -100 %
7 12 NIC 12 -100 %
8 14 NIC 12 -100 %

Figure H-7 Partition(s) List Screen When NParEP is Enabled

See "Configuring NPar" on page 303 for more information on configuring the additional functions.

Configuring Boot Options

To view the Boot Configuration screen:

1. From Port Menu (Figure H-4), select **2. Boot Configuration** and press **<Enter>**. The Boot Configuration screen appears.

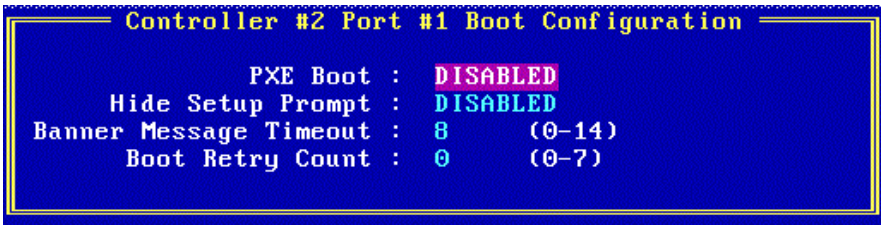
Controller #2 Port #1 Boot Configuration
PXE Boot : DISABLED
Hide Setup Prompt : DISABLED
Banner Message Timeout : 8 (0-14)
Boot Retry Count : 0 (0-7)

Figure H-8 Boot Configuration Screen

From the Boot Configuration screen, you can perform the following tasks:

- Configure PXE boot support – see "Configuring PXE Boot Support" on page 307 for instructions.
- Configure the Hide Setup prompt – see "Configuring the Hide Setup Prompt" on page 307 for instructions.
- Configure the banner message timeout – see "Configuring the Banner Message Timeout" on page 307 for instructions.

- Configure the boot retry count – see "Configuring the Boot Retry Count" on page 307 for instructions.

Configuring PXE Boot Support

To configure PXE boot support:

1. On the Boot Configuration screen, use the left or right arrow keys to enable or disable the PXE Boot setting.
2. Press **<F7>** to save.

Note: During system startup when PXE boot is enabled, PXE contacts the DHCP server for an IP address to boot from the network.

Configuring the Hide Setup Prompt

This setting enables or disables the CTRL<P> setup prompt (banner) during POST.

To configure the Hide Setup prompt:

1. On the Boot Configuration screen, use the left or right arrow keys to enable or disable the Hide Setup Prompt setting.
2. Press **<F7>** to save.

Configuring the Banner Message Timeout

This setting controls the number of seconds that the PXE banner message is displayed during POST. The valid range is 0–14.

To configure the banner message timeout:

1. On the Boot Configuration screen, use the left or right arrow keys to select the desired amount of time (in seconds) for the Banner Message Timeout setting.
2. Press **<F7>** to save.

Configuring the Boot Retry Count

This setting specifies the number of boot retry attempts before control is returned to the system BIOS. Valid values include:

- 0 (no retry)
- 1–7

To configure the boot retry count:

1. On the Boot Configuration screen, use the left or right arrow keys to select the desired number of retries for the Boot Retry Count setting.
2. Press **<F7>** to save.

Configuring Port Options

To view the Port Configuration screen:

1. From Port Menu (Figure H-4), select **3. Port Configuration** and press **<Enter>**. The Port Configuration screen appears.

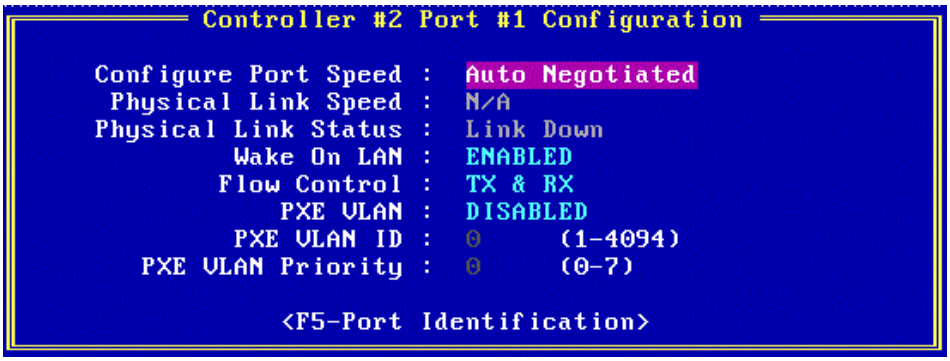

Figure H-9 Port Configuration Screen

2. From the Configure Partition screen, you can perform the following tasks:
   - Set the configured port speed – see "Setting the Configured Port Speed" on page 308 for instructions.
   - View the physical link speed and link status.
   - Configure Wake on LAN (WoL) – see "Configuring Wake on LAN" on page 308 for instructions.
   - Configure flow control – see "Configuring Flow Control" on page 309 for instructions.
   - Configure PXE VLAN, including the PXE VLAN ID and priority – see "Configuring the PXE VLAN ID and Priority" on page 309 for instructions.
   - Identify the port – see "Physically Identifying the Port" on page 309 for instructions.

Setting the Configured Port Speed

To set the port speed:

1. On the Port Configuration screen, use the left or right arrow keys to select **Auto Negotiated**, **10G**, or **1G** for the Configured Port Speed setting.
2. Press **<F7>** to save.

Configuring Wake on LAN

To configure Wake on LAN:

1. From the Port Configuration screen, use the left or right arrow keys to enable or disable the Wake on LAN setting.
2. Press **<F7>** to save.

Configuring Flow Control

This setting allows you to configure the type of flow control used by the adapter.

Note: Ethernet flow control cannot be changed when priority flow control is enabled on the switch ports and enabled in the firmware (through the OneCommand Manager application).

To configure flow control:

1. From the Port Configuration screen, use the left or right arrow keys to select one of the following settings for the Flow Control setting.
   - TX & RX
   - TX (Send Pause on RX Overflow)
   - RX (Throttle TX on Pause Received)
   - Disabled
2. Press **<F7>** to save.

Configuring the PXE VLAN ID and Priority

To configure a PXE VLAN ID and set the priority level:

1. On the Port Configuration screen, use the left or right arrow keys to enable the PXE LAN setting.
2. For the PXE VLAN ID, use the left or right arrow keys to enter a number from 1-4094.
3. For the PXE VLAN Priority level, use the left or right arrow keys to enter a number from 0-7. This unique value assigns a priority to outbound packets containing a specified VLAN ID. Valid values range from 0-7, with 0 the highest priority level.
4. Press **<F7>** to save.

After you exit the PXESelect utility, the system will reboot for the configuration to take effect.

Physically Identifying the Port

To physically determine which port you are configuring by causing the link and activity LEDs of that port to blink:

1. On the Port Configuration screen, press **<F5>**.
2. The LEDs on your controller begin blinking. The selected port's LED status indicators blink on your controller for approximately 15 seconds.

Note: Not all controllers have LEDs that are visible externally. If you are using an add-in card in a blade server environment, the port identification or beaconing capability does not work.

Erasing Ports and Controller Configuration

Note: When selecting this setting, all previous configuration settings are returned to their factory default settings including the current protocol selection. Emulex recommends performing this action to provide a clean environment for new configuration settings to take effect.

To erase the ports and controller configuration:

1. On the Controller Configuration screen (Figure H-2), press **<F8>** to restore the factory default settings. A warning appears asking if you want to erase the current configuration for all ports of the controller.
2. Press **<Y>** to delete the configuration. You will receive another warning asking you to confirm the permanent removal of the controller configuration.
3. Press **<Y>** to delete the configuration.

To exit the PXESelect utility after erasing the ports and controller configuration:

1. Follow the instructions on the bottom of the individual menu screens until you are prompted to exit.
2. Press **<Y>** to exit. Depending on what settings were changed, a reboot may be necessary.

   Note: For older systems, depending on the memory allocation method supported, the PXESelect utility automatically reboots even when there are no changes made to the system.

PXE Boot Parameters Default Values

The default settings for the PXE Boot parameters are listed in the following table.

Table H-1 PXE Boot Parameter Default Values

Parameter	Default Value	Valid Values
Hide Setup Prompt	Disabled	Enabled Disabled
Banner Message Timeout	8	0–14
Port Speed	Auto Negotiated	Auto Negotiated 10G 1G
PXE Boot	Disabled **Note:** On some Dell LOMs, this setting is enabled by default on port 1.	Enabled Disabled
Boot Retry Count	0	0 (no retry) 1–7 Retries

Table H-1 PXE Boot Parameter Default Values (Continued)

Parameter	Default Value	Valid Values
Wake on LAN	Enabled	Enabled Disabled
Flow Control	TX & RX	TX & RX TX RX Disabled
PXE VLAN	Disabled	Enabled Disabled
PXE VLAN ID	0	1–4094
PXE VLAN Priority	0	0–7
Virtualization Mode	None	NPar SRIOV None
NParEP Support	Disabled	Enabled Disabled
Protocol	NIC	NIC FCoE iSCSI Disabled
Min BW	25%	The total bandwidth is distributed evenly across all the enabled partitions.
Max BW	100%	From the minimum bandwidth value up to 100% (inclusive).

Appendix I. Booting the Solaris Operating System from the Network on SPARC Systems

To boot the Solaris operating system from the network on SPARC systems:

1. Set up the Jumpstart server and automated install (AI) server.
2. Obtain the MAC address of the ELXNIC port used for the net boot:.
   a. Get the device path of the port from the show-devs command:

```
{0} ok show-devs
/pci@0/pci@0/pci@8/pci@0/pci@1/oce@0,1
/pci@0/pci@0/pci@8/pci@0/pci@1/oce@0
```

   b. Select the OCE device to boot:

```
{0} ok " /pci@0/pci@0/pci@8/pci@0/pci@1/oce@0,1" select-dev
```

   c. Get the MAC address of the selected device from its properties:

```
{0} ok .properties
vf-assigned-addresses    c3030000 00000041 00060000 00000000 00004000
assigned-addresses       c3030010 00000041 00000000 00000000 00004000
                         c3030018 00000041 00020000 00000000 00020000
                         c3030020 00000041 00040000 00000000 00020000
                         82030030 00000000 00100000 00000000 00080000
vf-reg                   43030000 00000000 00000000 00000000 00004000
model                    OCe14102-N
fw-ver                   10.2.107.1
mac-address              00 90 fa 41 3b 40
local-mac-address        00 90 fa 41 3b 40
fcode-version            10.2.12.0
reg                      00030000 00000000 00000000 00000000 00000000
                         03030010 00000000 00000000 00000000 00004000
                         03030018 00000000 00000000 00000000 00020000
                         03030020 00000000 00000000 00000000 00008000
                         02030030 00000000 00000000 00000000 00040000
compatible               pciex10df,720.10df.e800.10
                         pciex10df,720.10df.e800
                         pciex10df,720.10
                         pciex10df,720
                         pciexclass,020000
                         pciexclass,0200
max-frame-size           000005ee
address-bits             00000030
supported-network-types  Ethernet,10000,null,full
copyright            Copyright (c) 2009-2013 Emulex. All rights reserved.
name                     oce
device_type              Network
manufacturer             Emulex
fcode-ver                1.00a1
```

```
fcode-rom-offset         0003c600
vf-stride                00000001
first-vf-offset          00000020
total-vfs                00000020
initial-vfs              00000020
#vfs                     00000020
port-type                PCIE-Endpoint
interrupts               00000001
cache-line-size          00000010
class-code               00020000
subsystem-id             0000e800
subsystem-vendor-id      000010df
revision-id              00000010
device-id                00000720
vendor-id                000010df
```

3. Add the MAC address from step 2 as an installation client to the install or boot server.
4. Power on the client machine and wait for the "ok" prompt.
5. Set the oce net device alias for the device selected in step 2.

   ```
   {0} ok devalias net <device_path>
   ```
6. Boot from the network.
   - If using the DHCP boot strategy, type

     ```
     {0} ok boot net:dhcp
     ```
   - If using the RARP boot strategy, type

     ```
     {0} ok boot net:rarp
     ```